MATURI VENKATA SUBBA RAO ENGINEERING COLLEGE

(An Autonomous Institution)

BACHELOR OF ENGINEERING

ACADEMIC REGULATIONS, SCHEME OF INSTRUCTION & SYLLABI (R-21)

CIVIL ENGINEERING

(I,II,III & IV Semesters)

ACADEMIC YEAR 2022-23

(Sponsored by Matrusri Education Society, Estd.1980)

ACADEMIC RULES AND REGULATIONS
for
Four Years
BACHELOR OF ENGINEERING
DEGREE PROGRAMMES

Maturi Venkata Subba Rao (MVSR) Engineering College

(An Autonomous Institution)

(Sponsored by Matrusri Education Society, Estd.1980)

Approved by AICTE, Affiliated to Osmania University
Accredited by NAAC and ISO 9001:2015 Certified Inst.
NBA Accreditation: CIVIL, CSE, ECE, EEE, IT and MECH.

website: www.mvsrec.edu.in

Counseling Code: TSEAMCET/TSECET/TSICET: MVSR

PGECET: MVSR1

(*For the batch admitted in 2022-23 *(R-21))

B.E. PROGRAMMES
(Full-time)

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of
ACADEMIC RULES & REGULATIONS

ACADEMIC RULES AND REGULATIONS

For Four Year Degree Programme in Engineering

of

Maturi Venkata Subba Rao (MVSR) Engineering College

*(*For the batch admitted in 2022-23 *(R-21))*

PREAMBLE: All the Rules and Regulations, hereinafter specified shall be read as a whole for the purpose of interpretation. Any reference to college in these Rules and Regulations stands for Maturi Venkata Subba Rao (MVSR) Engineering College. In case of arising a doubt, the interpretation of the Academic Council, the Statutory Body constituted as per UGC regulations of the college is final. The Academic council has the powers to make amendments to these regulations whenever necessary and shall be approved by Governing Body (GB).

ABBREVIATIONS:

AC	Academic Council
AICTE	All India Council for Technical Education
BE	Bachelor of Engineering
BoS	Board of Studies
GB	Governing Body
C	Credits
CGPA	Cumulative Grade Point Average
CIE	Continuous Internal Evaluation
CP	Credit Point
D	Drawing
GO	Government Order
GP	Grade Point
L	Lecture
MOOC	Massive Open Online Course
MVSREC	Maturi Venkata Subba Rao Engineering College
NPTEL	National Programme on TechnologyEnhanced Learning
P	Practical
SEE	Semester End Examination
SGPA	Semester Grade Point Average
SWAYAM	StudyWebs of Active Learning for Young and Aspiring Minds
T	Tutorial
UG	Under Graduate
UGC	University Grants Commission

NOMENCLATURE:

S. No.	Keywords	Definition
1	**Governing Body**	Highest administrative body of the Institute. GB is an authority as per the AICTE/ UGC regulations and responsible to perform functions as may be necessary and deemed fit for the proper development ofthe institution.
2	**Academic Council**	Highest academic body of the Institute and is responsible for the maintenance of standards of instruction, education and examination within the Institute. Academic Council is an authority as per the AICTE / UGC regulations and has the right to take decisions on all academic matters including academic research.
3	**Academic Year**	A period that is necessary to complete courses of study. It consists oftwo consecutive (one odd +one even) semesters.
4	**Autonomous Institute**	An Institute designated as 'Autonomous' by University Grants Commission (UGC), New Delhi in concurrence with the affiliating University i.e., Osmania University, Hyderabad and Telangana State Government.
5	**Board of Studies**	An authority, as defined in UGC regulations, constituted by the Principal for each of the department separately. The board is responsible for curriculum design and update in respect of all the programmes offered by a department.
6	**Course**	Usually referred to, as „papers" is a component of a programme. All courses need not carry the same weightage. The learning objectives and learning outcomes are defined for each course. A course is designed to comprise lectures/ tutorials/ laboratory work/ field work/ outreach activities/ project work/ vocational training/viva/ seminars/ term papers/ assignments/ presentations/self-studyetc. or a combination of some of these.
7	**Course Evaluation**	Continuous Internal Evaluation (CIE) in the Semester & Semester End Examination (SEE) constitutes the main assessment prescribed for each course.
8	**Continuous Internal Evaluation (CIE)**	To be normally conducted by the course instructor which includes class tests, problem solving exercises, group discussions, assignments, quizzes, mini-projects & seminars conducted anytime throughout the semester.
9	**Credit**	A unit by which the course work is measured. One credit is equivalent to one lecture hour of teaching (lecture or tutorial) or two hours of practical / field work per week.
10	**Grade Point**	It is a numerical weight allotted to each letter grade on a 10-point scale. A+ =10, A = 9, B = 8, C = 7, D = 6, E = 5 and F = 0.
11	**Credit Point**	A product of grade point and number of credits for a course.

12	**Cumulative Grade Point Average (CGPA)**	It is a measure of overall cumulative performance, of a student in all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters of the program. It is expressed upto two decimal places.
13	**Programme**	A programme or specialization of a degree programme like Civil Engineering, Mechanical Engineering etc.
14	**Curriculum**	Curriculum incorporates all the courses that are offered in a specific programme. It also indicates the planned interaction of students with instructional content, materials and resources.
15	**Degree**	A student who fulfills all the programme requirements is eligible to receive a degree.
16	**Grading**	To be normally done using Letter Grades as qualitative measure of achievement in each Course like: A+ (Outstanding), A (Excellent), B (Very Good), C (Good), D (Average), E (Pass), F (Fail) based on the marks (%) scored in (CIE+SEE) of the course and conversion to grade done byrelative/absolute grading.
17	**Mandatory Courses**	Compulsory non-credit courses that a student need to study as prescribed in the programme.
18	**Massive Open Online Courses (MOOC)**	Open access online courses aimed at providing ways to learn new skills.
19	**Revision of regulations, Curriculum andSyllabi**	The institution, from time to time may revise, amend or change the regulations, scheme of examinations, curriculum and syllabi with the approval of the academic council.
20	**Semester End Examination (SEE)**	To be normally conducted at the institutional level which will cover the entire course syllabi. The SEE questions are to be set from each unit. The questions are to be based on Blooms Taxonomy
21	**Semester**	Each year of study is divided into two semesters. Semester shall consist of 16 weeks of academic work excluding Semester End Examination and Evaluation.
22	**Semester Grade Point Average (SGPA)**	It is a measure of performance of work done in a semester. It is ratio of total credit points secured by a student in various theory and lab courses offered in each semester and the total course credits taken during that semester. It shall be expressed upto two decimal places.

I. ADMISSION PROCEDURE

1. A candidate for admission to the Four Year Degree Programme in Engineering must have passed the Intermediate Examination of the Board of Intermediate Education, Government of Telangana with Mathematics, Physics and Chemistry as optional courses, or any other examination recognized bythe Government of Telangana as equivalent thereto.

2. A candidate will be admitted strictly in accordance with the guidelines issued by State Government of Telangana fromtime to time.

II. DURATION AND PROGRAMMES OF STUDY

The duration of the programme is eight semesters (four years) such as I, II, III, IV, V, VI, VII and VIII. Each academic year shall comprise of two semesters.

Instruction per semester	---	16 weeks
Preparation holidays (includes practical exams)	---	02 weeks

No admission/ readmission/ promotion are entertained after four weeks of the commencement of instruction of semester in I, II, III and IV years.

In case there are any court cases consequent to which the authorities are compelled to admit any candidate after the announced last date of admissions, the admission (seat) of such a student would be reserved for the subsequent year on a supernumerary basis.

No refund of Tuition fee will be made after the commencement of instruction for students who wish to cancel their admission.

1. The following programmes of studyare offered by the college.

S. No	Programme
i).	Automobile Engineering
ii).	Civil Engineering
iii).	Computer Science and Engineering
iv).	Electrical and Electronics Engineering
v).	Electronics and Communication Engineering
vi).	Information Technology
vii).	Mechanical Engineering

The schedule of study of all programmes is regulated by the Academic council of Maturi Venkata Subba Rao (MVSR) Engineering College.

2. Candidate who fails to fulfill all the requirements for the award of the degree as specified here in after within (N+2) academic years from the time of admission, *as per the UGC Guidelines on determination of uniformspan period (UGC Letter No. F-12-1/2015 (CPP-II) dated and 15.10.2015 and Osmania University letter No.336/M/Acad.I/2016 dated 21.03.2016)*, will forfeit his/her seat in the programme and his/her admission will stand cancelled, where „N" is the number of years of programme of study. For four year regular B.E. degreeprogrammemaximumdurationofstudyis(N+ 2) =4+2 = 6 years.

   Candidate admitted to the second year under lateral entry scheme shall fulfill all the requirements for the award of the degree as specified here in after within (N+2=3+2=5) five academic years from the time of admission failing which he/she will forfeit his/her seat and his/her admission will stand cancelled.

III. RULES AND REGULATIONS OF ATTENDANCE

1. Candidates admitted to a particular programme of study are required to pursue **Regular programme of study** before they are permitted to appear for the Semester End Examination.

2. **A regular programme of study** means putting in attendance of not less than 75% in each semester.

3. In special cases and for sufficient cause shown, the Academic Council (AC) may condone the deficiency in attendance to the extent of 10% on medical grounds subject to the submission of medical certificate (signed by Competent Authority) along with the payment of condonation fee too.. However, in respect of women candidates who seek condonation of attendance due to pregnancy, the Academic Council (AC) on the specific recommendations may condone the deficiency in attendance to the extent of 15% (as against 10% condonation for others) on medical grounds(Valid Medical certificate) subject to submission of medical certificate to this effect. Such condonation is permitted only once during the programme of study.

   Medical certificate along with the fitness is to be submitted within a week days on reporting to the class work.

   * **Shortage of attendance below 65 % shall in no case be condoned.**

4. The fee for condonation of attendance on medical grounds shall be Rs. 2000/- (Rupees Two Thousand only) payable through DD/ Banker Cheque drawn in favour of Principal, Maturi Venkata Subba Rao (MVSR) Engineering College.

5. Attendance of N.C.C / N.S.S Camps or Inter collegiate or Inter-University or Inter State or International matches or debates or Educational Excursions or such other Inter University activities as approved by the authorities involving journeys outside the city in which the college is situated will not be counted as absence.

   (i) Such absence shall not exceed four weeks per semester of the total period of instructions.

   (ii) Such leave should be availed with prior permission from the Principal and not be availed more than twice during the programme of study.

   (iii) Without anyprior permission, such leave shall be treated as absence.

   (iv) While calculating the attendance, the number of classes not attended in each subject shall be added to the numerator.

6. The attendance shall be calculated on the aggregate of courses from the date of commencement of classes/ date of readmission in case of detained candidates as per the almanac.

7. In case of candidates who fail to put in the required attendance in a programme of study, he/she shall be detained in the same semester and will not be permitted to appear for the Semester End Examination. Such candidates shall have to seek readmission into the same semester during the subsequent year in order to appear for the examination after fulfilling the attendance requirements and on payment of requisite tuition fee.

IV. SCHEME OF INSTRUCTIONS AND EXAMINATION

1. Instructions in various courses in each semester of all four years shall be provided by the college as per the scheme of instruction and syllabi prescribed. All students have to register for the courses offered in the Semester before starting of that particular semester.

2. The total number of credits for all eight semesters is 160 as per AICTE Model Curriculum

3. The distribution of marks/grade* based on Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE) shall be as follows:

Subject	Continuous Internal Evaluation (CIE)	Semester End Examination (SEE)
Each theorysubject	**30 ****	**70 ******
Each practical or drawing Subject for which less than 6 periods / week are provided in the scheme of instruction	**25 ****	**50**
Each practical or drawing Subject for which 6 or more Periods/week are provided in the scheme of instruction	**50 *****	**100**
Project I	**50 #**	**---**
Project II	**50 #**	**100 ##**

Total marks = CIE + SEE

***** Grades are allotted based onthe marks secured in CIE and SEE as per the following criteria.

Academic Performance	Grade		Grade points
	Letter	Description	
90% ≤ Marks ≤ 100%	**A +**	Outstanding	10
80% ≤ Marks < 90%	**A**	Excellent	9
70% ≤ Marks < 80%	**B**	Very Good	8
60% ≤ Marks < 70%	**C**	Good	7
50% ≤ Marks < 60%	**D**	Average	6
40% ≤ Marks < 50%	**E**	Pass	5
0% ≤ Marks < 40%	**F**	Fail	0
	AB	Absent	

** Out of 30 CIE marks for theory, 10 marks are allotted for Assignments/Tutorials/Quizzes etc. (At least two assignments and two quizzes are to be conducted) in the course. The rest of the 20 marks are allotted to internal tests. Two internal tests will be conducted in each semester. Each test will carry 20 marks, out of which 6 marks for PART-A (compulsory), consisting of three short answer questions and from Part- B two questions consisting of subjective questions are to be attempted from the remaining three questions and each question carries 7 marks. Average of two tests plus marks obtained in assignments/tutorials/quizzes etc. will be taken as CIE marks.

*** Out of 25/50 CIE marks for Practical/drawing, 10/ 20 are allotted for viva- voce exam / Quiz test, 15/30 marks for laboratoryrecord/drawing sheets and observations.

**** The SEE question paper consists of seven questions and each question carries 14 marks. The first question is compulsory and covers the entire syllabus as part A. Student has to answer four questions from the remaining six questions that cover the entire syllabus as part B.

The CIE evaluation of BE Project (Project - I & II) consists of a maximum of 50 marks which will be distributed as per the guidelines given below:

(i) **30 Marks** are allocated for qualityof the project work covering
- (a) Literature review
- (b) Innovation/ Originality
- (c) Methodologyand
- (d) Relevance / Practical application which will be awarded bythe supervisor.

(ii) **20 Marks** are allocated to candidate"s performance in terms of viva-voce examination and overall subject knowledge. Marks will be awarded by the committee constituted bythe HoD.

The evaluation of BE Project (Project II) for Semester End Examination consists of a maximum of 100 marks which will be distributed as per the guidelines given below:

(i) **50 Marks** are allocated for qualityof the project work covering
- (a) Literature review
- (b) Innovation / Originality
- (c) Methodologyand
- (d) Relevance/ Practical application, which will be awarded jointly by the internal and external examiners.

(ii) **50 Marks** are provided for candidate"s presentation and performance in terms of viva-voce examination and overall subject knowledge. Out of 50 Marks 30 marks will be awarded by the internal examiner and 20 marks by the external examiner concerned.

Note:

(i) A course that has CIE but no SEE as per scheme is treated as Pass/ Fail for which pass marks are 40% of CIE marks.

(ii) Mandatory courses shall not carry any credits but, securing **40% of total marks**, shall be **necessary requirement** for the student to qualify for the **award of Degree.**

1. The details of instruction period, examination schedule, vacation etc. shall be notified by the Principal, Maturi Venkata Subba Rao Engineering College.

2. The mediumof instruction and examination shall be English.

3. At the end of each semester, SEE shall be held as prescribed in the respective Schemes of Examination. The examinations pertaining to the semester just ended, will be called, regular examinations and the examinations pertaining to the other semesters will be called supplementary examinations. To enable the B.E. Final Year students to complete the program requirements in time, there shall be a Make-up / Supplementary Exam for VIII semester only, which will be scheduled within one month of publication of results of VIII semester regular examinations.

4. The examinations prescribed may be conducted by means of written papers, practical and viva-voce, inspection of certified CIE work in Drawing and Laboratories and Workshop, or by means of any combination of these methods as may be deemed necessary. Candidates will be required to produce complete Lab Records of the Practical work done by them in each practical examination, along with other materials prepared or collected as part of Laboratorywork / Project.

5. All the general rules for examinations (given under item no. X) shall be adhered to.

6. A candidate shall be deemed to have fullypassed a course, if he/she secures

   - A minimum of 40% marks for each theory course in the Semester End Examination (SEE)
   - A minimum of 40% marks (E – Grade) for each theory course considering both CIE and SEE.
   - A minimum of 50% marks for each Practical/ Drawing/ Project work in the Semester End Examination (SEE)
   - A minimum of 50% marks (D – Grade) for each Practical/ Drawing/ Project work considering both CIE and SEE.

   Important note: The candidate has to mandatorily appear at the SEE in all the Practical/Laboratory/Drawing Courses irrespective of marks secured under CIE.

7. In case of hearing impaired, orthopedically handicapped and visually challenged candidates, 10% reduction in pass marks in each subject is admissible as per G.O. Ms. No.150, dated 31-08-2006.

8. If a candidate desires to have his/her answer scripts revaluated, he/she can apply for it as per the college norms and notification ofthe College Examination Branch.

9. A candidate can also obtain a photocopy of the corrected answer book of the theory courses of SEE only against payment. For more details in this regard, the press note of the College Examination Branch after the declaration of results may be referred.

V. RULES OF PROMOTION

S. No.	Semester / Class	Conditions to be fulfilled
1.	From I-Semester to II-Semester	Regular programme of studyof B.E. I-Semester
2.	From II-Semester to III-Semester	a) Regular programme of studyof B.E. II-Semester b) Must have earned at least 50% of credits (rounded to the next nearest integer) prescribed for B.E. I-Semester and II-Semester.
3.	From III-Semester to IV-Semester	Regular programme of studyof B.E. III-Semester
4.	From IV-Semester to V-Semester	a) Regular programme of studyof B.E. IV-Semester

		b)	No. of backlog credits, if any of B.E. I, II, III and IV Semester put together shall not exceed 50% (rounded to the next nearest integer) of the total number of credits prescribed for the B.E. III & IV-Semester
5.	From V-Semester to VI-Semester	Regular programme of studyof B.E. V-Semester	
6.	From VI- Semester to VII-Semester	a)	Regular programme of studyof B.E. VI-Semester
		b)	Number of backlogs, if any of B.E. I, II,III, IV, V and VI Semester put together shall not exceed 50% (rounded to the next nearest integer) of the total number of credits prescribed for the B.E. V & VI-Semester
7.	FromVII-Semester to VIII-Semester	Regular programme of studyof B.E. VII-Semester	

Note: 1. If a candidate has more than permitted number of credits as backlogs, he/she will be detained.

2. The candidate who wishes to take readmission into the year in which he/she is detained will have to pay the total tuition fee of that year and all the credits earned during that year shall become null and void.

VI. GRADING SYSTEM

1. Candidates who have passed all the examinations of the B.E. Degree Programme shall be awarded Cumulative Grade Point Average (CGPA) in accordance with the grade secured by them in all eight Semesters taken together, including the CIE marks secured in those semesters.
   The grade secured shall be shown in the memorandum of marks as per the performance in CIE and SEE.
   A minimum CGPA of 5 is required for the award of Degree. The consolidated memorandum of marks will reflect the credits/ grade scored in each course.

1. Semester Grade Point Average (SGPA) & Cumulative Grade Point Average (CGPA)

Calculation:

a) $$\text{SGPA} = \frac{\sum_{i=1}^{p} (\text{Letter Grade Point}_i \times \text{Credits}_i)}{\sum_{i=1}^{p} \text{Credits}_i}$$

Where i = 1, 2, …..p represent the number of courses in a particular semester. SGPA is calculated upto second decimal point and it is calculated only when all courses in that semester are Cleared/ Passed.

b) $$\text{CGPA} = \frac{\sum_{j=1}^{m} [(\text{SGPA})_j \times (\text{Total Credits})_j]}{\sum_{j=1}^{m} \text{Total Credits}_j}$$

where j= 1, 2, ….mrepresent the number of semesters ofthe entire programme.

CGPA at a given point of Semester is calculated upto second decimal point. It is calculated only when total credits earned are equal to total credits prescribed as per scheme upto a semester in which the candidate has last appeared for SEE.

c) Courses in which the candidate has failed are not included in computing SGPA/ CGPA.

VII. AWARD OF DEGREE

The degree of bachelor of engineering will be conferred on candidate who has pursued a regular programme of study of four academic years (three academic years for candidates admitted in II-Year under lateral entry scheme), as hereinafter prescribed in the scheme of instruction and has passed all the examinations as prescribed in the scheme of examinations.

Note: For **mandatory and audit courses (non-credit),** student shall be awarded a Grade without anycredit. This shall not be counted for the computation of SGPA/CGPA.

VIII. AWARD OF GOLD MEDAL

(i) A student securing highest CGPA in **single attempt** is eligible for award of Gold Medal.

(ii) Areadmitted student is not eligible for Gold medal.

IX. IMPROVEMENT OF OVERALL SCORE

1. A candidate who wishes to improve his/her overall score may do so within one academic year immediately after having passed all the examinations of the B.E. degree programme, by reappearing in not more than two semesters (all courses pertaining to the semester takentogether) examinations without violating the rule mentioned in the item II.3.

2. For the award of the overall score, he/she will have the benefit of the higher SGPA secured in the corresponding semester(s).

X. GENERAL RULES OF EXAMINATIONS

1. Application for permission to appear in any examination shall be made available online through college website (www.mvsrec.edu.in) as per the notification.

2. When a candidate"s application is found in order and he/she is eligible to appear in Semester End Examination (SEE), the College Examination Branch shall furnish him with a Hall-Ticket, enabling the candidate to appear in the Semester End Examination. The Hall-Ticket shall have to be produced by the Candidate before he/she is admitted to the premises where the Examination is likelyto be held.

3. A candidate who does not present himself/herself for examination for any reason whatsoever, excepting shortage of attendance, shall not be entitled to claim refund of the whole or part ofthe examination fee, for subsequent Examination(s).

4. A candidate after he/she has been declared successful in the all examinations, shall be given a provisional certificate stating the year of examination, the branch in which he/she was examined and, the overall grade secured. However, the candidates have to obtain degree certificate (convocation) fromthe Examination Branch, Osmania University, Hyderabad.

5. No candidate shall be allowed to put in attendance for a programme or appear at examinations for different degrees and different faculties simultaneously.

6. Students who have appeared once in any examination of the programme need not put in fresh attendance, if they wish to reappear at the corresponding examination, notwithstanding the fact that the college may have introduced new courses. They will, however, have to appear at the examinations according to the scheme of examination any syllabi in force.

XI. TRANSITORY REGULATIONS

1. Whenever a course or scheme of instruction is changed in a particular semester/year, two more examinations immediately following thereafter shall be conducted according to the old syllabus/regulations provided the content in the course has changed more than 40%.

2. Candidates not appearing at the examinations or failing in them shall take the examination subsequentlyaccording to the changed syllabus/regulations.

XII. RANGE OF CREDITS

1. A regular student will be eligible to get an Under Graduate degree in Engineering if he/she secures the credits as specified in the Scheme of Instruction and Examinations.
   A lateral entry student shall be declared eligible to get an Under Graduate degree in Engineering if he/she
   a) Secures required credits as specified in the Scheme of Instruction and Examinations from Semester - III to Semester - VIII
   b) Qualifies bridge courses and mandatory courses specified if any during Semester - I and Semester – II

XIII. MALPRACTICE AND AWARD OF PUNISHMENT

Schedule on the Nature of Malpractice and Award of Punishment

"Examination" in this context refers to all the papers taken bythe candidate onthe same hall-ticket.

MALPRACTICE AND AWARD OF PUNISHMENT

S. No	Malpractice	Award of Maximum Punishment
1	Possession of the prohibited (written or printed) papers, books, notes during the examination period but which were not used.	Only that exam shall be cancelled. No reference either to the previous or future exams.
2	Matter relevant to the examination being written on any part of the body or on the clothes worn, or in the instrument, wrapping, etc.	-do-
3	Attempting to take help from any prohibited papers, notes, written or printed matter, writings on the walls, furniture and attempting to take help from or giving help to other regarding answer to any question or questions of the examination paper.	-do-

4	Taking help from or consulting of prohibited written or printed material; consulting and/or taking help from or helping other examinee during the examination period inside the examination hall or outside it; with or without their consent, or helping other	-do-
	candidate to receive help from anyother.	
5	An examinee who attempts to disclose his/her identity to the paper valuer by writing his/her roll number at a place other than the place prescribed for it, or by writing his/her name or any coded message or an examinee who makes an appeal to the paper valuer in the answer book.	-do-
6	Writing such as invocation of God"s name in any form.	To be ignored
7	Writing on the question paper or other papers; the answer to questions, rough work, etc., with no intention of passing it on to another examinee.	To be warned not to do so.
8	Using abusive and obscene language in the answer book.	To warn and assess on the basis of content.
9	Examinee allowing or destroying prohibited material found in his possession or acting in any other manner with a view to destroy evidence.	Only that exam shall be cancelled. No reference either to the previous or future exams.
10	Refusing to obey instructions of the Chief Superintendent/Invigilator.	Only that exam shall be cancelled. No reference either to the previous or future exams.
11	Smuggling an answer book/ additional answer book/ matter into or out of the examination hall.	Only that exam shall be cancelled. No reference either to the previous or future exams.
12	Inserting in or removing from the answer book/additional answer book of any sheet.	-do-
13	Substituting wholly or partly an answer book/additional answer book.	-do-
14	Impersonation even at a single examination.	To be dealt with as per Law.
15	Cases of examinees when conspiring to interchange in Roll Nos.	Only that exam shall be cancelled. No reference either to the previous or future exams.
16	Creation of disturbance or otherwise misbehaving in and around the examination hall during or before the examination.	Only that exam shall be cancelled. No reference either to the previous or future exams.
17	Guilty of assaulting/abusing intimidating any person connected with the examination work anytime before, during or after the examination.	Only that exam shall be cancelled. No reference either to the previous or future exams.
18	Punishments for malpractices not defined here would be recommended on the merits of the individual cases bythe malpractices committee.	

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Maturi Venkata Subba Rao (MVSR) Engineering College (Autonomous)
Department of Civil Engineering

Scheme of Instructions for B.E. (Civil Engineering) for 8 Semesters

S. No	Course Work – Subject Area	Credits/ Semester								Credits Obtained/ Required
		I	II	III	IV	V	VI	VII	VIII	
1	Humanities and Social Sciences (HS)	-	3	2	3	-	-	-	-	8/12
2	Basic Sciences (BS)	10	8	3	-	-	-	-	-	21/26
3	Engineering Sciences (ES)	10	7	4	3	-	2.5	-	-	26.5/29
4	Professional Subjects –Core (PC)	-	-	11	15	20	12	4	-	62/47
5	Professional Subject-Electives (PE)	-	-	-	-	-	6	9	6	21/23
6	Open Subjects – Electives (OE)	-	-	-	-	-	3	3	3	9/11
7	Project Work, Seminar and/or Internships (PW)	-	-	-	-	2	-	4	6.5	12.5/12
8	Mandatory Courses (MC) (Non-Credit)	-	-	-	-	-	-	-	-	-
	TOTAL	20	18	20	21	22	23.5	20	15.5	160/160
	Contact Hours/ Week	25	26	25	24	24	26	23	22	

B.E. (Civil Engineering) I - SEMESTER

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	P/D	Contact Hrs/ week	CIE	SEE	Duration of SEE (Hrs)	
Theory Courses										
1	U21BSN01MT	Engineering Mathematics-I	3	1	-	4	30	70	3	4
2	U21BSN02PH	Applied Physics	3	-	-	3	30	70	3	3
3	U21ES101CE	Engineering Mechanics	3	-	-	3	30	70	3	3
4	U21ES102CE	Building Materials and Construction Practice	2	-	-	2	30	70	3	2
5	U21ESN01CS	Programming for Problem Solving using C	3	-	-	3	30	70	3	3
Practical/ Laboratory Courses										
6	U21BSN81PH	Physics Lab	-	-	4	4	25	50	3	2
7	U21BSN81MT	Computational Mathematics Lab	-	-	2	2	25	50	3	1
8	U21ESN81CS	Programming for Problem Solving using C Lab	-	-	4	4	25	50	3	2
Total			**14**	**01**	**10**	**25**	**225**	**500**	**-**	**20**

* **3 Weeks** induction program will be organized before commencement of the coursework of Semester – I

BS: Basic Science,
ES: Engineering Science
HS: Humanities and Social Sciences

L: Lecture
T: Tutorial
P: Practical
D: Drawing

CIE: Continuous Internal Evaluation
SEE: Semester End Evaluation

Note:
1. Each contact hour is a clock hour
2. The duration of the practical class is two hours, however it can be extended wherever necessary, to enable the student to complete the experiment.

Course Code	Course Title						Core/Elective
U21BSN01MT	**Engineering Mathematics - I**						**Core**
Prerequisite	Contact Hour s per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**1**	**-**	**-**	**30**	**70**	**4**

Course Objectives

The objectives of this course is to

- Introduce the concepts of sequences, series and their properties
- Introduce the concepts of mean value theorems and curvature
- Introduce the concepts of multiple integrals
- Study vector differential and vector integral calculus

Course Outcomes

After completing this course, the student will be able to:

- Determine the convergence of infinite series using various tests of convergence
- Solve problems based on the fundamental theorem of differential calculus, find radius of curvature, evaluate and envelopes and expand functions using Taylor & MacLaurin series
- Evaluate Double and Triple integrals in Engineering Problems
- Solve problems based on vector differentiation.
- Solve problems based on vector integration

UNIT-I:

Infinite Series: Introduction to sequences, Infinite series, general properties of infinite series, geometric series, series of positive terms, Harmonic series(p-series),Comparison test, D' Alembert's ratio test, Raabe's test, Cauchy's nth root test, Alternating series, absolute and conditional convergence

UNIT-II:

Differential Calculus: Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem(without proofs) and their applications, Taylor and Maclaurin series, Curvature, Radius of curvature(Cartesian form),Centre of Curvature, Evolute and Involute, Envelope of a family of curves

UNIT-III:

Multiple Integrals: Introduction to functions of two and three variables, Double integrals, Change of order of integration, Change of variables from Cartesian to Plane Polar coordinates, Triple integrals(Cartesian)

UNIT-IV:

Vector Differentiation: Scalar and vector point functions, Vector operator del, Gradient, Unit normal vector, Directional derivative, Angle between surfaces, Divergence, solenoidal vector, Curl, Irrotational vector, Laplace operator applied to scalar and vector point functions.

UNIT-V:

Vector Integration: Line integral-work done, Surface integral, Volume integral, Green's theorem in a plane, Stoke's theorem, Gauss divergence theorem(without proofs) and their verifications.

Text Books:

1. R. K. Jain &S. R .K. Iyengar, *Advanced Engineering Mathematics*, Narosa Publications, 5th Edition 2016.
2. B. S. Grewal, *Higher Engineering Mathematics*, Khanna Publications, 44th Edition, 2018.

Reference Books:

1. B.V. Ramana, Higher Engineering Mathematics, 23rd reprint, 2015.
2. N. Bali, M. Goyal, *AtextbookofEngineeringMathematics,* Laxmi publications, 2010
3. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley, 9th Edition, 2012.
4. B. Thomas Jr. and Ross L. Finney *Calculus and Analytic Geometry*.
5. M. Tom. Aposta, l *Calculus: One -Variable Calculus with An Introduction to Linear Algebra*, Vol 1

Course Code	Course Title						Core/Elective
U21BSN02PH	**Applied Physics**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**		**-**	**-**	**30**	**70**	**3**

Course Objectives

The objectives of this course is to

- To explain the concepts of elasticity.
- To provide knowledge on basics concepts of Solid State Physics.
- To provide the concept of Laser technology, Optical fibers and their applications
- To introduce the concept of Acoustics and Ultrasonics.
- To introduce Nano Science and Nanotechnology .

Course Outcomes

After completing this course, the student will be able to:

- Recall the fundamental principles of elasticity and relate to the advanced level courses.
- Explain Crystal Structures and Crystal Defects
- Explain the principle of Laser and Optical Fiber; Summarize different types of Laser sources and Optical fibers; Identify the applications of Lasers and Optical Fibers
- Describe the fundamental principles of acoustics; summarize the production, detection, properties and applications of Ultrasonics.
- Summarize various types of Nanomaterials, their preparation methods and list out various Characterization Techniques and applications of Nanomaterials..

UNIT-I:

Elasticity: Concepts of Elasticity, Plasticity, Stress , Strain and Hooke's Law, Different Moduli of elasticity- Young's Modulus, Bulk Modulus, Rigidity Modulus and Poisson's Ratio, Relation between Elastic moduli, Torsional Pedulum, Bending of Beam.

UNIT-II:

Crystallography And Crystal Defects: Crystalline and non-crystalline solids, Space lattice, Basis, Unit cell and crystal structure, Crystal systems and Bravais lattices, Simple Cubic, Body Centered and Face Centered Cubic structures, Miller Indices - crystal planes, Interplanar spacing 'd' , Bragg's law, Powder diffraction method.Crystal defects- types of defects in crystals, Point defects- Schottky and Frenkel defects, Concentration of Frenkel defects in ionic crystals, Line defects- Edge and Screw dislocations, Burger's vector.

UNIT-III:

Lasers And Optical Fibers: Introduction to LASERs, Characteristics of Lasers, Spontaneous and Stimulated emissions, Components of LASERs, LASERs operating in UV- Vis-IR Regions, Types of LASERS- Solid State LASER(RUBY LASER), Gas LASER(He-Ne Laser), and Semiconductor LASER, Applications of LASERs.

Introduction to Optical fibre, Basic principle – Total internal reflection, Propagation of light through the fibre - Numerical Aperture and Acceptance angle, Step-Index and Graded- Index optical fibres, Applications of Optical fibres.

UNIT-IV:

Acoustics And Ultrasonics: Classification of Sound Waves- Noise and Music, Weber- Fechner Law, Reverberation, Reverberation Time, Sabine's Formula, Determination of Absorption Coefficient, Factors affecting the Architectural acoustics and their remedies. Introduction to Ultrasonic's, Properties of Ultrasonic waves, Production of Ultrasonic waves by Piezo electric and Magnetostriction methods, Detections of Ultrasonic's, Determination of wavelength of Ultrasonic waves, Applications of Ultrasonic's.

UNIT-V:

Nano Materials And Experimental Techniques: Origin of Nano Science- Bulk and Nano materials, types of nanomaterials, Surface to volume ratio and Quantum confinement effect, properties of nanomaterials, fabrication of nanomaterials- Top-down approach and Bottom-up approach, Ball milling method, and Sol-Gel methods, elementary ideas of Carbon nanotubes (CNT'S)Applications of nanomaterials. Material characterization techniques-X-Ray diffraction, Atomic Force Microscopy- Nanoindentation, SEM and TEM.

Text Books:

1. M.S. Avadhanulu and P.G. Kshirasagar, *A text book Engineering Physic*s, S. Chand and Co., 9th edition, 2010.
2. R.K. Gaur and S.L. Gupta, *Engineering Physics*, Dhanpat Rai publications, 8th edition, 2001.
3. B.K. Pandey and S. Chaturvedi, *Engineering Physics*, Cengage Learning India(P) Ltd., 2012
4. R. Murugesan and K. Sivaprasath, *Modern Physics*, S. Chand & Company, 13th edition, 2007.
5. A. Goswami, *Thin Film Fundamentals*, New Age International, 2007.
6. A.K. Bandopadhyay, *Nano Materials*, New Age International, 1st edition, 2007.
7. K.J. Pratap. et.al, .*Engineering Physics*
8. M. Armugam, *Engineering Physics*

Course Code	Course Title						Core/Elective
U21ES101CE	**Engineering Mechanics**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives

The objectives of this course is to impart knowledge of

- Resolution of forces, equilibrium of force systems consisting of static loads
- Obtaining centroids and moment of inertia for various regular and irregular areas.
- Various forces in the axial force members, and to analyse the trusses using various methods,
- Concept of friction for singleand connected bodies.
- Basic concepts of dynamics, their behavior, analysis and motion bodies
- Work energy principles and impulse momentum theory and applications to problems solving

Course Outcomes

After completing this course, students will be able to:

- Apply the fundamental concepts of forces, equilibrium conditions for static loads.
- Understand concept of Spatial force system and analyze friction for single and connected bodies.
- Determine the centroid and moment of inertia for various sections.
- Apply the basic concepts of dynamics, their behavior, analysis and motion bodies.
- Solve problems involving work energy principles and impulse momentum theory.

UNIT–I:

Introduction to Engineering Mechanics: Basic Concepts

System of Forces: Coplanar Concurrent Forces, Components in Space – Resultant of coplanar and spatial systems, Moment of Force and Couple and its Application to coplanar system

Equilibrium of Systems of Forces: Free Body Diagrams, Equations of Equilibrium and applications toCoplanar System.

UNIT –II:

Spatial Forces: Introduction to spatial force system, resultant of forces in space

Friction: Theory of friction, Laws of friction, Friction connected to single and connected bodies. Wedgefriction.

UNIT –III:

Centroid: Centroid of simple areas (from basic principles), Centroid of Composite areas.

Area Moment of Inertia: Definition, Moment of inertia of simple areas (from basic principles), PolarMoment of Inertia, Transfer formula, Moment of Inertia of Composite areas.

UNIT –IV:

Kinematics: Introduction, Motion of particle, Rectilinear and Curvilinear motions, Velocity and Acceleration, Types of Rigid body, Angular motion, Fixed axis rotation.

Kinetics: Introduction fundamental equation of kinetics for a particle, D'Alembert's principle for particle motion, connected system and Fixed Axis Rotation.

UNIT –V:

Work-Energy Method: Introduction, Equations for Translation, Work- Energy Applications to Particle Motion, Connected System and Fixed Axis Rotation.

Impulse Momentum Method: Linear impulse momentum, law of conservation of momentum, coefficientof restitution, Elastic impact**.**

Text Books:

1. Ferdinand L.Singer, *Engineering Mechanics*, Collins, Singapore, 1975
2. K. Reddy Vijay Kumar and K. Suresh Kumar, Singer's Engineering Mechanics, 2010
3. S. S. Bhavakatti, *Engineering Mechanics*, New age International publishers.
4. S. Rajeshakharam and G. Sankara subrahmanyam, *Mechanics*, Vikas Publications, 2002
5. S. B. Junarkar and H. J. Shah, *Applied Mechanics*, publishers 2001.

Course Code	Course Title						Core/Elective
U21ES102CE	**Building Materials and Construction Practice**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives

The objectives of this course is to impart knowledge

- About the physical properties, uses, manufacturing process of building materials used in structural components
- In acquiring materials for Smart/Green buildings
- Of different types of construction procedures for various building components

Course Outcomes

After completing this course, students will be able to:

- Classify various types of construction materials – bricks, stones, timber and their uses
- Demonstrate the composition, properties & types of cement, mortar and aggregates
- Understand various types of concrete, smart building materials, plastering & pointing
- Recognize various types of formworks, scaffolding and also importance of fire protection & damp roof course
- Know the different types of floors and staircases.

UNIT – I:

Stones: Uses of stones as building materials, classification, characteristics, dressing and polishing of stones,methods of quarrying and construction.

Bricks: Methods of manufacturing bricks. Classification and methods of construction.

Timber: Timber as a building material and its uses. Methods of seasoning and preservation laminates and their uses. Defects in Timber.

UNIT – II:

Cement: Introduction to cement, different grades, IS specifications and OPC and PPC Cements (blendedcements).

Mortar and Sand: Characteristics of good mortar making sand, availability of sand ant its classification,bulking of sand, manufacturing methods -of mortar. Different types of mortars- preparation, setting and curing.

Coarse and fine Aggregate: Characteristics of good coarse and fine aggregates for manufacture of concrete. Significance and application of coarse and fine aggregate for the production of goodqualityconcrete.

UNIT – III:

Concrete: Various types of Concrete and their Applications.

Smart Building Materials: Energy conservation in buildings- use of recycled materials, regional materials andindustrial waste products as means of sustainable development. Green Building Materials.

Plastering and Pointing: Different types of plasters and plastering process, defects in plastering.

UNIT – IV:

Form work- Types of Form work, types of materials used in form work

Scaffoldings- Types of Scaffoldings, Scaffolding Erection & dismantling, Scaffolding Inspection

Fire protection in structures- Classification of fire, general causes of fire, detection of fire, methods for fire control, Fireresistance of wood, steel, concrete and masonry.

Damp Proof Course-Causes of dampness, effects of dampness, methods of damp proofing

UNIT –V:

Floors - Types of floors and methods of construction of floors.

Stair Cases - Components of stair, Different types of staircases.

Text Books:

1. V. N. Vazirani, and S.P. Chandola, *Engineering Materials*, Khanna Publishers 1993.
2. Sushil Kumar, *Building Construction*, Standard Publishers 1992.
3. S. P. Arora and S.P. Bindra, *Text book on Building Construction*, Dhanpath Raj Publications, 1999.
4. M. S. Shetty, *Concrete Technology*, S. Chand Publishers, 2012.
5. Gurucharansingh, *Building materials and construction*, Standard book house, 2010

Course Code	Course Title						Core/Elective
U21ESN01CS	**Programming for Problem Solving Using C**						**Core**
Prerequisite	Contact Hour s per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives

The objectives of this course is to impart knowledge of

- To introduce the concept of computing environment, number systems, algorithms, flowcharts and implementation using variables with various data types and selection statements.
- To introduce the logic building techniques using control statements and arrays
- To understand modular and structure programming using functions and strings
- To learn the alternative to iteration using recursion and familiarization with structures and macros
- To understand memory management using pointers and dealing with files

Course Outcomes

After completing this course, the student will be able to:

- Formulate simple algorithms/flowcharts there by translating them into programs using variables with various data types and selection statements.
- Implement logic building techniques using control statements and arrays
- Apply modular and structure programming using functions and strings
- Analyze the iteration with recursion and implementation of structures and macros.
- Illustration of memory management techniques using pointers and implement the file handling approach

UNIT-I:

Introduction to computers: Introduction to components of a computer system, Operating system, Number system: Decimal, binary, octal, hexa decimal systems.
Algorithms/Flowcharts: Logical and Numerical problem solving
Introduction to C Programming: Structure of C, Execution phases in C (Compiler, interpreter, Linker, loader), C-tokens, syntax & semantics in compilation, Identifiers, variables, keywords, Data Types, Operators, precedence & associativity rules, Expression evaluation, Type conversion.
Selection statements: simple if, if-else, else-if ladder, nested if-else, switch

UNIT-II:

Iteration statements: while, do-while, for, **Unconditional statements:** break, continue, goto, return
Arrays: 1-D arrays, **Searching Techniques:** Linear, binary search, **Sorting algorithms:** bubble sort and selection sort,2-D arrays: Matrices

UNIT-III:

Strings: Defining & initializing strings, String manipulation functions (predefined, user-defined)
Functions: Taxonomy of functions, built-in functions, parameter passing techniques: call by value, Passing arrays to functions: Idea of call by reference
Storage classes: auto, register, static, extern

UNIT-IV:

Recursive functions: Recursion definition, Iteration vs Recursion, Example programs: GCD, Factorial, sum of digits, fibonacci
Structures: Defining & accessing structured data, Array of structures, passing structure to function, nested structures, Difference between structure & union
Preprocessor directives: Macros, #define, #if, #elif

UNIT-V:

Pointers: Introduction to pointers, Defining pointers, pointer arithmetic, Array of pointers, pointer to array, Null pointer, generic pointer, double pointers, passing pointer to function: call by address, Accessing structure using pointer, self-referential structure, Dynamic memory allocation

File Handling: I/O streams, File operations, file modes, Sequential/Random accessing files, command line arguments.

Text Book:

1. B.A. Forouzan and R.F.Gieverg, "A structured Programming Approach in C" language learning 2013.

Reference Books:

1. Paul Deitel & Harvey Deitel, *"C How to program"* 7th edition,PHI
2. A.K. Sharma,, *"Computer Fundamentals and Programming in C"* - Universities Press,2nd edition,2018
3. E. Balagurusamy, *"Programming in ANSI C"* -, TMH, 2008
4. Byron Gottfried - "*Theory and practice of Programming with C",* Schaum's Outline McGrawHill,1990
5. Pradip Dey, Manas Ghosh, *"Programming in C"*- Oxford University Press, 2nd edition
6. Brian W Kernighan and Dennis M Ritchie, *"The C programming Language",* Prentice Hall of India,1988

Course Code	Course Title						Core/Elective
U21BSN81PH	**Physics Lab**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	**4**	**25**	**50**	**2**

Course Objectives

During the course the student is expected to

- To analyze a Semiconducting device and determine its temperature Coefficient of Resistance, Energy Gap, ElectricalConductivity, Mobility, concentration of charge carriers and its efficiency.
- To determine the wavelength of given laser source, Sodium vapour lamp by using diffraction grating.
- To explain the principle of Optical Fiber and determine its Numerical Aperture, Acceptance Angle and losses.
- To demonstrate Torsional Pendulum, LCR Series and Parallel Circuit and calculate Rigidity Modulus of a given wireand frequency of LCR Series and Parallel Circuit.
- To examine the nature of Ferro Magnetic Materials, Dielelctric Materials and Calculate their related parameter
- To explain Seebeck Effect and Determine Seebeck Coefficient of thermoelectric device.

Course Outcomes

After completing this course, the student will be able to:

- Analyze a Semiconducting device and determine its temperature Coefficient of Resistance, Energy Gap, ElectricalConductivity, Mobility, Concentration of charge carriers and efficiency.
- Determine the Wavelength of Laser source, Sodium Vapour lamp using diffraction grating.
- Explain the principle of Optical Fiber and determine its Numerical Aperture, Acceptance angle and losses.
- Demonstrate Torsional Pendulum, LCR series and Parallel circuit and calculate the Rigidity Modulus of givenmetallic wire, resonant frequency of LCR Series & Parallel circuit.
- Examine the nature of ferromagnetic materials, dielectric materials and calculate their related parameter
- Explain Seebeck Effect and determine Seebeck Coefficient of thermoelectric device

List of experiments:

1. To Determine the Numerical aperture (NA), Acceptance Angle of the Optical Fiber, and To study the various losses of that occur in optical fiber.
2. To determine the wave length (λ) of the given Laser source.
3. To determine V-I characteristics of the given LED.
4. To draw the V-I characteristics of a Solar Cell and calculate the Fill Factor and Series Resistance.
5. To draw the I - V Characteristics of P-N Junction diode and to evaluate the resistance for forward biasand revers bias.
6. To determine the constants of A, B and α using Thermistor characteristics.
7. To find the values of Electrical conductivity and energy gap of Ge crystal.
8. To determine the wave length of radiation emitted by Sodium vapour lamp using Diffraction Grating.
9. To study the behavior of Series LCR Resonant circuit and to estimate the resonant frequency and Q factor.
10. To study the variation in currant and voltage in parallel LCR Circuit and to find the resonant frequency of parallel LCR Circuit.
11. Determination of rigidity of modulus of Torsional pendulum.
12. To determine the Dielectric constant ofthe given Dielectric samples.
13. To draw the curve between the magnetizing field and the intensity of magnetization of the specimen (soft iron rod) and to find out i) Coercivity ii) Retentivity and iii) Hysteresis loss.
14. To calculate Seebeck Coefficient of the given sample.
15. To determine the Hall coefficient, Carrier concentration and mobility of charge carriers of semi conducting material.
16. To determine the velocity of the Ultrasonic Waves

Course Code	Course Title						Core/Elective
U21BSN81MT	**Computational Mathematics Lab**						**Core**
Prerequisite	Contact Hour s per Week				CIE	SEE	Credits
	L	T	D	P			
-	**-**	**-**	**-**	**2**	**25**	**50**	**1**

Course Objectives

The objectives of this course is to

- know the history and features of Math tools like SCI LAB/MATLAB
- know the local environment of MATLAB/SCI LAB
- study the concept of definite integrals, differential equations and system of equations using MATLAB/SCI LAB
- study the concept of Eigenvalues and Eigenvectors using MATLAB/SCI LAB.
- study simple mathematical functions using 2D and 3D plots

Course Outcomes

After completing this course, the student will be able to:

- understand the main features of the MATLAB/SCI LAB program development environment to enable their usage in the higher learning
- evaluate definite integrals using MATLAB/SCI LAB.
- solve linear differential equations with constant coefficients using MATLAB/SCI LAB .
- solve system of linear equations using MATLAB/SCI LAB.
- find Eigenvalues and Eigenvectors using MATLAB/SCI LAB
- Interpret and visualize simple mathematical functions using 2D and 3D plots.

List of Programs:

1. Introduction to MATLAB and GUI
2. Basic operators of MATLAB/ SCI LAB
3. Finding roots of algebraic equations.
4. Determinant of matrices.
5. Rank of a matrix
6. Solving system of linear equations using matrices.
7. Eigenvalues.
8. Eigenvectors.
9. Solutions of first order linear differential equations.
10. Solutions of second order linear homogeneous differential equation with constant coefficients.
11. Evaluating definite integrals
12. Data plotting for 2D and 3D

Reference Books:

1. Computational Mathematics Lab Manual.

Course Code	Course Title						Core/Elective
U21ESN81CS	**Programming for Problem Solving Using C Lab**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	**4**	**25**	**50**	**2**

Course Objectives

The objectives of this course is to impart knowledge of

- Understand the fundamentals of programming in C Language.
- Write, compile and debug programs in C.
- Formulate solutions to problems and implement them in C.
- Effectively choose programming components to solve computing problems
- To apply the sorting and searching techniques on given set of data

Course Outcomes

After completing this course, the student will be able to:

- Choose appropriate data type for implementing programs in C language.
- Design and implement modular programs involving input output operations, decision making and looping constructs.
- Implement search and sort operations on arrays.
- Apply the concept of pointers for implementing programs on dynamic memory management and string handling.
- Design and implement programs to store data in structures and files.

Write C programs for following:

1. Express and compute few mathematical equations in C language

Selection statements:

2. Finding roots of a quadratic equation
3. Implement arithmetic calculator using switch
4. Check whether entered year is a leap year or not

Iteration statements:

5. Find maximum and minimum value in a given set of numbers
6. Print multiplication table of value X upto Y times
7. Print prime numbers between M & N, Check for armstrong number or not
8. Convert a decimal number to binary and vice versa
9. Display pyramid of numbers and pascal triangle upto N rows

Arrays:

10. Find maximum, minimum and sum of all numbers in a 1-D array
11. Implement linear & binary search using 1-D array
12. Implement bubble sort & selection sort using 1-D array
13. Find the sum and product of two matrices using 2-d arrays
14. Check whether a matrix is an identity matrix or not using 2-d arrays
15. **Programs on Strings:** perform string manipulation functions , convert a lowercase string into uppercase
16. Demonstrate on call by value & call by reference using functions
17. **Programs on Recursion:** GCD, sum of digits, fibonacci series, factorial

Structures & Union:

18. Using an array of structures, Store 5 students information (name, roll no, subject1,subject2,subject3,total_marks), compute total_marks of each student and display details of each student.

19. Store 3 employee information (name, salary, designation) and access each employee using union.

Pointers:

20. Demonstrate on pointer arithmetic
21. Find the biggest and smallest of array using pointer to array
22. Implement dynamic memory allocation

Files:

23. Writing/reading/appending some data to a file
24. Copy the contents of one file to other file
25. Count the frequency of characters, lines and words in a given file

Text Books:

1. Paul Deitel & Harvey Deitel "*C How to program"* by 7th edition,PHI
2. A.K. Sharma, *"Computer Fundamentals and Programming in C"*-, Universities Press,2nd edition,2018
3. E. Balagurusamy, *Programming in ANSI C* TMH, 2008
4. Byron Gottfried - *"Theory and practice of Programming with C",* Schaum's Outline McGrawHill,1990
5. Pradip Dey, Manas Ghosh ,*"Programming in C"*-, Oxford University Press, 2nd edition
6. Brian W Kernighan and Dennis M Ritchie, *"The C programming Language"*, Prentice Hall of India,1988

B.E. (Civil Engineering) II – SEMESTER

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	P/D	Contact Hrs/ week	CIE	SEE	Duration of SEE (Hrs)	
Theory Courses										
1	U21HSN01EG	English	2	-	-	2	30	70	3	2
2	U21BSN02MT	Engineering Mathematics-II	3	-	-	3	30	70	3	3
3	U21BSN02CH	Applied Chemistry	3	-	-	3	30	70	3	3
Practical/ Laboratory Courses										
4	U21HSN81EG	English Lab	-	-	2	2	25	50	3	1
5	U21BSN81CH	Chemistry Lab	-	-	4	4	25	50	3	2
6	U21ESN81ME	Workshop Practice	-	-	4	4	25	50	3	2
7	U21ESN81CE	Computer Aided Engineering Drawing	1	-	4	5	50	50	3	3
8	U21ESN82CS	Programming for Problem Solving using Python Lab	-	-	4	4	25	50	3	2
Total			**9**	**-**	**18**	**27**	**240**	**460**	**-**	**18**

BS: Basic Science,
ES: Engineering Science
HS: Humanities and Social Sciences

L: Lecture
T: Tutorial
P: Practical
D: Drawing

CIE: Continuous Internal Evaluation
SEE: Semester End Evaluation

Note:
1. Each contact hour is a clock hour
2. The duration of the practical class is two hours, however it can be extended wherever necessary, to enable the student to complete the experiment.

Course Code	Course Title						Core/Elective
U21HSN01EG	**English**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**30**	**70**	**2**

Course Objectives

The objectives of this course is to enhance the English language abilities of students by

- Using authentic material for language learning
- Developing appreciation to a variety of content-rich texts
- Strengthening their grammar and vocabulary
- Improving reading and comprehension skills and also encouraging them to think critically and creatively
- Honing their writing skills

Course Outcomes

After completing this course, the student will be able to:

- Demonstrate the skill of reading to summarize, paraphrase and give an accurate account of authentic texts of various genres
- Infer and make predictions based on the comprehension of a text
- Employ Academic Vocabulary appropriately with a distinction of its formal and informal use
- Apply different reading strategies to comprehend different texts and decode new words encountered
- Undertake guided and extended writing using accurate grammatical structures and vocabulary

Unit-I

Reading : A.G. Gardener – "On Saying Please"
Vocabulary : Word formation-Prefixes, Suffixes, Root Words
Grammar : Articles, Prepositions, Determiners
Writing : Guided Writing (Expanding the outline/Writing from verbal cues)

Unit –II

Reading : Fritz Karinthy – "Refund "
Vocabulary : Word formation- Compounding and Blending, Contractions
Grammar : Transitions, Connectives
Writing : Paragraph-writing

Unit- III

Reading : Narayan Murthy – "Value System"
Vocabulary : Synonyms, Antonyms, One Word Substitutes
Grammar : Voice
Writing : Letter-writing

Unit- IV

Reading : Robert Frost – "Stopping by Woods on a Snowy Evening"
Vocabulary : Homophones, Homonyms, Homographs
Grammar : Narration (Direct-Indirect Speech)
Writing : Precis writing

Reading	:	Stephen Leacock – "On the Need for a Quiet College"
Vocabulary	:	Inclusive Language, Euphemisms
Grammar	:	Tenses
Writing	:	Paraphrasing and Summarizing

Unit- V

Text Books:

1. Board of Editors. Language and Life: A Skills Approach. Orient BlackSwan, 2018.
2. Sudharshana, NP and C Savitha, English For Engineers. Cambridge University Press, 2018.
3. Kumar, Sanjay and Pushp Lata, English Language and Communication Skills for Engineers. Oxford University Press,

Course Code	Course Title						Core/Elective
U21BSN02MT	**Engineering Mathematics - II**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives

The objectives of this course is to

- Provide an overview of ordinary differential equations and their applications.
- Study Linear algebra and its uses in solving system of linear equations.
- Study Eigenvalue problems and Quadratic forms.
- Study the special functions Gamma and Beta functions.

Course Outcomes

After completing this course, the student will be able to:

- Solve first order differential equations.
- Solve higher order differential equations.
- Solve system of linear equations.
- Solve eigenvalue problems and Quadratic forms.
- Apply Beta and Gamma Functions to evaluate definite integrals

UNIT-I:

Differential Equations of First Order: Exact differential equations, Integrating factors, Linear differential equations, Bernoulli's and Riccati's. Applications of first order differential equations - Orthogonal trajectories of a given family of curves(Cartesian form) Newton's Law of Cooling, Growth and Decay.

UNIT-II:

Differential Equations of Higher Order: Solutions of second and higher order linearhomogeneous equations with constants coefficients, Solutions of non-homogeneous linear differential equations with constants coefficients, Method of reduction of order, Method of variation of parameters,Applications of second order differential equations-LCR circuits.

UNIT-III:

Matrices: Rank of a matrix, Elementary Row/Column operations, Echelon form, Normal form, Linear dependence and independence of vectors, System of linear equations, Linear transformation.

UNIT-IV:

Eigenvalues and Eigenvectors: Eigenvalues, Eigenvectors, properties of Eigenvalues,Cayley -Hamilton theorem(without proof), Quadratic forms, Reduction of quadratic form to canonical form, Rank, Index, Signature and Nature of quadratic forms.

UNIT-V:

Special Functions: Gamma function, Beta function, properties of Gamma and Beta functions, relation between Beta and Gamma functions, evaluation of definite integrals using Beta and Gamma functions.

Text Books:

1. R. K. Jain & S .R. K. Iyengar, *Advanced Engineering Mathematics,* Narosa Publications, 5th Edition 2016.
2. B. S. Grewal, *Higher Engineering Mathematics*, Khanna Publications, 44thEdition,2018.

Reference Books:

1. B.V. Ramana, *Higher Engineering Mathematics*, 23rd reprint, 2015.
2. N. Bali, M. Goyal, *A text book of Engineering Mathematics*, Laxmi publications,2010.
3. Erwin Kreyszig, *Advanced Engineering Mathematics,* John Wiley, 9th Edition, 2012.

Course Code	Course Title						Core/Elective
U21BSN02CH	**Applied Chemistry**						**Core**
Prerequisite	Contact Hour s per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives

The objectives of this course is to

- To relate how the basic concepts and principles of chemistry can be applied to practical utility in a broader perspective of the society.
- To distinguish the ranges of electromagnetic spectrum and its interaction with matter and to develop knowledge of various spectroscopic techniques at atomic and molecular levels.
- To identify and apply various principles of electrochemistry and corrosion which are essential for an engineer in industry
- To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineerTo provide an overview of ordinary differential equations and their applications.

Course Outcomes

After completing this course, the student will be able to:

- Apply the knowledge of electrode potentials in finding feasibility of electrochemical reactions, construction of electrochemical cells, understanding the mechanism of corrosion, factors affecting metallic corrosion and corrosion control by various methods.
- Summarize the knowledge in thermodynamic principles and their applications.
- Appraise the basic concepts of engineering materials such as polymers, composites, and lubricants.
- Classify various energy sources and illustrate the importance and applications of renewable and non-renewable energy sources.
- Estimate the physical and chemical parameters of quality of water and explain the process of water treatment
- Relate the concepts of Phase rule and green chemistry to modify engineering processes and materials.Solve problems based on vector differentiation.

UNIT-I:

Electro Chemistry & Corrosion and It's control: Electro Chemistry: Electrochemical Cells-Electrolytic and galvanic cells-notation. Cell Reaction and Cell EMF. Electrode potential, Standard electrode potential. Electrochemical series and Applications. Free Energy and EMF. Nernst equation and its derivation, Applications -Numerical problems. Types of electrodes-Standard hydrogen electrode, Calomel electrode Silver-Silver Chloride, Quinhydrone and glass electrodes. Determination of pH using Quinhydrone electrode coupled with saturated Calomel electrode.

Corrosion: Definition, Causes and effects. Types of corrosion, Chemical corrosion, and its mechanism. Electrochemical corrosion and its mechanism. Galvanic corrosion, Concentration cell Corrosion-Waterline and Pitting corrosion. Factors effecting rate of corrosion. Corrosion control methods- Cathodic Protection –Sacrificial anode and impressed current cathode methods. Surface Coatings-Types. Electro plating and Electroless plating of metal coatings.

UNIT-II:

Thermodynamics: Definition of terms: System, Surroundings. Types of thermodynamic systems and processes. Reversible and irreversible processes. Extensive and Intensive properties. The concept of Internal energy, Enthalpy. Work done in isothermal and adiabatic reversible and irreversible processes- Numericals. **First law of thermodynamics and its limitations.**

Second law of thermodynamics- statements. Spontaneous and non-spontaneous processes. Concept of Cyclic processes. The Carnot cycle and efficiency of reversible heat engine. Carnot's theorem. Concept of entropy -Entropy changes in

reversible and irreversible processes. Physical significance of entropy. Gibbs-Helmotz free energy and its significance. Variation of free energy with T, P. Criteria for spontaneity /feasibility of process. Numerical problems.

UNIT-III:

Engineering Materials: Polymers: Basic terminology - Monomer and its functionality, Polymers, and degree of polymerization. Types of Polymerizations - Chain Growth, Step Growth Polymerization – Examples.Plastics, Fibers, Elastomers – Characteristics and Examples.Preparation, Properties & Applications – PVC, Bakelite, Nylon 6:6, Kevlar, Buna-S, Butyl Rubber, and Silicone Rubber.**Composite materials:** Introduction of composites, constituents of composites. Advantages of composites. Classification of composites based on matrix, reinforcement, and ply. Applications of composites.**Lubricants**: Definition, classification with examples. Function of lubricants, Types of lubrication and mechanism – Thick Film or Hydrodynamic Lubrication, Thin Film or Boundary Lubrication, Extreme Pressure Lubrication. Properties of lubricants – Viscosity, flash and fire point, cloud and pour point, acid value. Saponication number.

UNIT-IV:

Energy Sources: Introduction-Renewable and non-renewable energy sources with Examples. Chemical fuels: Definition, Classification of chemical fuels-primary, Secondary and Solid, Liquid, Gaseous fuels -examples. Solid fuels: Coal & its composition, and its ranking. Liquid fuels: Petroleum- Fractional distillation of petroleum. Cracking and its significance. Knocking, Octane Number and Cetane number. Gaseous Fuels: LPG, CNG- composition, properties and uses. Biodiesel: Concept -Transesterification- Carbon neutrality. Advantages of Bio-diesel. Batteries: Definition, Types of batteries-Primary batteries; Zn-Carbon battery. Secondary batteries; Lead-acid, Lithium -ion batteries. Fuel cells: Definition, Construction and working of H2-O2 fuel cells and Methanol- O2 fuel cells. Solar cells: Concepts of photovoltaic cell and its applications.

UNIT-V:

Water Chemistry, Green Chemistry and Phase Rule: Water & its Treatment: Hardness of water – Types- Units of hardness. Estimation of temporary and permanent hardness of water by EDTA method- Numerical problems Alkalinity of water and its determination- Numerical problems. Softening of water by a) Ion exchange process. b) Zeolite Process, c) Desalination of water by Reverse Osmosis. Specifications of potable water. Sterilization by Chlorination. Break-point chlorination.

Green Chemistry: Concept, Principles of green Chemistry with Examples.

Phase rule: Definition of terms: Phase, Component, and degrees of freedom. Phase rule – state ment and equation. Application to one component system-Water system. Condensed phase rule-two component system; Pb-Ag system. Pattinson's process of desilverization of lead. Safety fuses and Solders.

Text Book:

1. P.C. Jain, M. Jain Engineering Chemistry, Dhanapathi Rai and sons (16th edition), New Delhi

Reference Books:

1. Sashi Chawla, Textbook of Engineering Chemistry, Dhanapathi Rai &sons, New Delhi.
2. O.G. Palanna, Engineering Chemistry, TMH Edition.
3. Puri, Sharma and Pathania Principles of physical chemistry, Vishal Publishing Co.
4. Polymer chemistry by Gowariker.
5. Shikha Agarwal, Engineering Chemistry fundamentals and applications, Cambridge University press.

Course Code	Course Title						Core/Elective
U21HSN81EG	**English Lab**						**Core**
Prerequisite	Contact Hour s per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	**2**	**20**	**50**	**1**

Course Objectives

The objectives of this course is to enhance the listening and speaking skills of students by

- Giving them sufficient practice in listening with comprehension.
- Providing them ample opportunities to improve their public speaking skills.
- Training them in the use of correct pronunciation, stress, and intonation.
- Sensitizing them to the use of verbal and non-verbal communication appropriate to the context.
- Encouraging them to learn the art of conversation to suit formal and informal situation.
- Preparing them to make formal presentations and face interviews.

Course Outcomes

After completing this course, the student will be able to:

- Listen, understand, and interpret formal and informal spoken language
- Speak English with acceptable pronunciation, stress, and intonation
- Present themselves with confidence in formal situations
- Be able to perform in fluency, accuracy and time management based activities such as JAM and Picture Perception
- Participate in individual and group activities with relative ease.

List of Activities:

1. Listening for Comprehension
2. Pronunciation, Intonation, Stress, and Rhythm
3. Conversation Skills
4. Introducing Oneself and others
5. Asking for and Giving Information
6. Making Requests and Responding to them Appropriately
7. Giving Instructions and Responding to them Appropriately
8. Making Formal Announcements and Emceeing
9. Picture Perception
10. JAM
11. Role play
12. Group Discussions
13. Interview Skills
14. Presentation Skills

Text Books:

1. Board of Editors. *Language and Life: A Skills Approach*. Orient BlackSwan, 2018.
2. Balasudbramanian, T. A Textbook of English Phonetics for Indian Students. Macmillan, 1981
3. CIEFL. *EXERCISES IN Spoken English.* Parts. I- III. Oxford University Press. Pillai,
4. Radhakrsihna G. Spoken *English For You – Level II*. 8the Edition. Emerald Publishers, 2014.
5. Sethi, J and PV Dhamija. *A Course in Phonetics and Spoken English*. 2ndEdition. Prentice Hall India Learning Private Limited, 1999.

Course Code	Course Title						Core/Elective
U21BSN81CH	**Chemistry Lab**						**Core**
Prerequisite	Contact Hour s per Week				CIE	SEE	Credits
	L	T	D	P			
-	**-**	**-**	**-**	**4**	**25**	**50**	**2**

Course Objectives

During the course the student is expected to

- Introduce practical applications of chemistry concepts to solve engineering problems.
- Measure the molecular or ionic properties such as conductance, redox potentials.
- To determine the rate constant of reactions from concentrations as a function of time.
- Know the laboratory practices implemented in a research and industrial chemistry laboratory setting.
- To learn to Synthesize polymers

Course Outcomes

After completing this course, the student will be able to:

- Estimate the hardness of water sample.
- Apply the principles of Electrochemistry & Colorimetry in quantitative estimations.
- Measure the properties of liquids such as surface tension and Viscosity.
- Estimate the rate constants, of reactions from concentration of reactants/ products as a function of time.
- Synthesize Polymer.

List of experiments:

1. Estimation of Fe (II) by Permanganometry.
2. Estimation of Fe (II) by Dichrometry.
3. Estimation of hardness of water by EDTA method.
4. Estimation of HCl by Potentiometry.
5. Potentiometric estimation of Iron Fe (II) by Permanganometry.
6. Estimation of HCl by Conductometry.
7. Estimation of CH_3COOH by Conductometry.
8. Estimation of HCl & CH_3COOH in mixture by Conductometry.
9. Estimation of HCl by pH metry.
10. Verification of Beer-Lamberts Law and estimation of Manganese in $KMnO_4$ by Colorimetry.
11. Determination of viscosity of liquids using Oswald's viscometer
12. Determination of Surface tension by using Stalagmometer.
13. Synthesis of nylon 6,6.
14. Determination of rate constant of acid catalyzed hydrolysis of methyl acetate.
15. Determination of Partition Coefficient of CH_3COOH in n-Butanol and Water.

Text Books:

1. Vogel's text book of Practical organic chemistry, 5thEdition.

Reference Books:

1. B.D. Khosala, A. Gulati and V. Garg, *Senior Practical Physical Chemistry*, (R. Chand & Co.,Delhi)
2. S.S.Dara, *Text book on experiments and Calculations in Engineering Chemistry*
3. K.K. Sharma and D.S. Sharma, *An introduction to practical chemistry* (Vikas Publications, NewDelhi)
4. S.K.Bhasin& Sudha Rani, *Laboratory manual on Engineering Chemistry*, (Dhanpat Rai Publishing Company.

Course Code	Course Title						Core/Elective
U21ESN81ME	**Workshop Practice**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**-**	**-**	**-**	**4**	**25**	**50**	**2**

Course Objectives

The objectives of this course is to impart knowledge of

- Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.
- To provide hands on experience about use of different engineering materials, tools, equipment's and processes those are common in the engineering field.
- To gain a good basic working knowledge required for the production of various engineering products.
- To study different hand operated power tools, uses and their demonstration.
- Adopt safety practices while working with various tools.

Course Outcomes

After completing this course, the student will be able to:

- Demonstrate an understanding of and comply with workshop safety regulations.
- Identify and apply suitable tools for different trades of Engineering processes including material removing, measuring and chiselling.
- Study and practice on machine tools and their operations
- Undertake jobs connected with Engineering Workshop trades including sheet metal and house wiring.
- Apply basic electrical engineering knowledge for house wiring practice.

A. Trade for Exercises:

Course Objective: To impart hands-on practice on basic engineering trades and skills.

1. **Carpentry**-Practice of Cross Half lap joint, Lap Dovetail joint and Briddle Joint
2. **Fitting** - Exercises - Preparation of straight fitting, semi-circular fitting and vee - fitting models
3. **House wiring-Exercises**-Single lamp, parallel/Series connection of 2 bulbs and Stair case wiring
4. **Sheet metal-**Forming and Bending. Model making. Exercises-Taper Tray, Open Scoop, Funnel.
5. **Smithy**-operations, upsetting, swaging, setting down and bending. Exercise –Round rod to Square, S-Hook, Round rod to Square headed bolt.
6. **Welding-**Introduction, Study of Tools and welding Equipment (Gas and Arc welding); Selection of welding electrode and current, Bead practice; Practice of Butt Joint, Lap Joint, Tee-Joint.
7. **Plumbing**-Practice of Internal threading, external threading, pipe bending, pipe fitting. Pipe connections with different joining components. Pipes with coupling for same diameter and with reducer for different diameters. Exercises-Practice of Tee-fitting, Union-fitting, Gate valves fitting.

B. IT WORKSHOP: Computer hardware, identification of parts, Disassembly, Assembly of computer to working condition, operating system installation.

1. System Assembling, Disassembling and identification of Parts / Peripherals
2. Operating System Installation-Install Operating Systems like Windows, Linux along with necessary Device, Drivers.
3. MS-Office / Open Office
    a) Word - Formatting, Page Borders, Reviewing, Equations, symbols.
    b) Spread Sheet - organize data, usage of formula, graphs, charts.
    c) Power point - features of power point, guidelines for preparing an effective presentation.
    d) Access- creation of database, validate data.

4. Network Configuration & Software Installation-Configuring TCP/IP, proxy and firewall settings. Installing application software, system software & tools.
5. Internet and World Wide Web-Search Engines, Types of search engines, netiquette, cyber hygiene.
6. Trouble Shooting-Hardware trouble shooting, Software trouble shooting**.**

Experiments Behind The Curriculum:

A. POWER TOOLS:

1. Study of different hand operated power tools, uses and their demonstration
2. Practice of all available Bosch Power tools.

Carpentry using Power Tools only:

a) Study of the joints in roofs, doors, windows and furniture
b) Hands-on-exercise: Wood work, joints by sawing, planning and cutting

Text Books:

1. K. Venugopal. *"Workshop manual",* Anuradha Publications, Kumbakonam, TN, 2012
2. K.C. John, *"Mechanical Workshop"* 2ndEdn., PHI, 2010.
3. Hajra Choudary, *"Elements of Workshop Technology"* Vol. 1, Asian Publishers, Edn., 1993.
4. G.S. Sawhney, *"Mechanical Experiments and Workshop Practice",* I.K. International Publishing House, New Delhi, 2009.
5. K. L. James, Computer Hardware, *Installation, Interfacing, Troubleshooting and Maintenance*, Eastern. Economy Edition.

Course Code	Course Title						Core/Elective
U21ESN81CE	**Computer Aided Engineering Drawing**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**1**	**-**	**4**	**-**	**50**	**50**	**3**

Course Objectives

The objectives of this course is to impart knowledge

- To make students communicate effectively through common drawing language in an effective way
- To prepare the students communicate using AUTOCAD with the help of technical knowledge
- To prepare the students in the engineering drafting skills
- To enhance the imaginative skills of students there by making them creative

Course Outcomes

After completing this course, students will be able to:

- Understand the importance of engineering drawing and its place in society
- Expose the virtual aspects of Engineering Drawing
- Recognize modern technical tools of engineering drawing like AUTOCAD and apply in different fields of engineering
- Think creatively in getting alternative options to practical problems in engineering
- Communicate technical aspects through engineering drawing

Sheet No	Description of the Topic	Contact Hours	
		Lecture	Drawing
1	Principles of Engineering Graphics and their significance, usageofdrawing instruments.	1	
2	***Conic Sections – I*** Construction of ellipse, parabola and hyperbola given focus andeccentricity.	1	2
3	***Conic Sections – II*** Construction of ellipse (given major and minor axis), parabola(given base and height), rectangular hyperbola.		2
4	***Cycloids*** (Cycloid, Epicycloids, Hypocycloid)	1	2
5	***Involutes*** (involute of triangle, square & circle)		2
6	***Scales*** (Plain, diagonal & Vernier scales)	1	2 + 2
7	***Introduction to AutoCAD*** Basic commands and simple drawings.		2 + 2
8	***Orthographic Projection*** Projections of points situated in different quadrants.	1	2
9	***Projections of straight lines – I*** Line parallel toboth the reference planes, line perpendicular orinclined to one reference plane.	1	2
10	***Projections of straight lines – II*** Line inclined to both thereference planes.	1	2

11	***Projections of planes – I*** Perpendicular planes	1	2
12	***Projections of planes – II*** Oblique planes		2
13	***Projections of solids – I*** Polyhedra and solids of revolution, Projections of solids in simpleposition.	1	2
14	***Projection of solids – II*** Projections of solids when the axes inclined to one or both thereference planes.	1	2 + 2
15	***Section of solids – I*** When the sectional plane is parallel or perpendicular to onereference plane.	1	2
16	***Section of solids – II*** When the sectional plane is inclined to one reference plane.		2
17	***Development of surfaces – I*** Prisms and Cylinders	1	2
18	***Development of surfaces – II*** Pyramids and Cones		2
19	***Intersection of surfaces – I*** Intersection of cylinder and cylinder	1	2
20	***Intersection of surfaces – II*** Intersection of cylinder and cone		2
21	***Isometric projection – I*** planes and simple solids	1	2
22	***Isometric projection – II*** combination oftwo or three solids		2
23	Conversion of Isometric Views to Orthographic Views	1	2

Text Books:

1. N.D. Bhatt, V. M Panchal & P. R. Ingle , *"Engineering Drawing",* Charotar Publishing House, 2014
2. M. B. Shah, & B. C. Rana , *"Engineering Drawing and Computer Graphics",* Pearson Education, 2008
3. S. N. Lal, *"Engineering Drawing with Introduction to Auto CAD",* Cengage Learning India Pvt Lid, New Delhi, 2018.
4. B. Agrawal & C. M. Agrawal, *"Engineering Graphics",* TMH Publication, 2012
5. K. L. Narayana, & P. Kannaiah, *"Text book on Engineering Drawing",* Scitech Publishers, 2008
6. (Corresponding set of) CAD Software Theory and User Manuals

Note:

1. At least 20 sheets must be drawn.
2. Sheet number 1 to 6 (Graph sheets / drawing sheets)
3. Sheet number 7 to 23 (AutoCAD drawings)

Course Code	Course Title						Core/Elective
U21ESN82CS	**Programming for Problem Solving using Python Lab**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-		-	-	**4**	**25**	**50**	**2**

Course Objectives

The objectives of this course is to impart knowledge of

- To introduce python programming environment
- Enabling students to learn basic fundamentals of python
- To improve logical skills by working with control statements, mathematical functions
- To learn about modular programming through functions and recursive programs
- To handle logical, syntax errors and define custom errors as per real world problems
- Enabling students to access files and perform operations
- To introduce and work with object oriented principles

Course Outcomes

After completing this course, the student will be able to:

- Implement basic syntax, semantics in python and improve logical skills
- Formulate mathematical computations, store data using strings, arrays, collection types
- Perform modular programming using functions and recursion
- Handle and define multiple exceptions logically, syntactically and also able to access files
- Analyze and implements OOP concepts in real world problems

Write python programs for the following:

1. Find distance between two points x1, y1, x2, y2 taking input from the user.
2. Read a set of numbers from the command line, add & print those numbers.
3. Determine checking whether a given year is a leap year or not.
4. Read a date and check whether the date is valid or not, if it is valid print incremented date.
5. Display two random numbers that are to be added, the program should allow the student to enter the answer. if the answer is correct, a message of congratulations should be displayed, if the answer is wrong the correct answer should be displayed.
6. Compute A. $\sum_{i=1}^{n}$ (n+nn+nnn+...) B. $\sum_{i=1}^{n}$ (1/n!) C. $\sum_{i=1}^{n}$ (nn)
7. Read x,y and print all prime numbers between x and y where x<=y
8. Check for “amicable” numbers, armstrong number & strong number
9. Read a number N and Print following patterns up to N rows:

A.
```
1
2 3
4 5 6
7 8 9 10
```

B.
```
*
* *
* * *
* *
*
```

10. Demonstrate on string operations
11. Matrix programs using numpy: addition, multiplication, identity, transpose
12. Determine the number of vowels and consonants from string using a function that accept string as argument.
13. Recursion programs: factorial, gcd, fibonacci series
14. Demonstrate on List, Set, Tuple, Dictionary

15. Creating a text file and writing some data to the file
16. Open an existing file, Read and display data from the file, display a message if file not found
17. Copy contents of a file to another file
18. Open a file and display the frequency occurrence of characters, lines, words in that file
19. Demonstrate on predefined multiple exceptions
20. Demonstrate on custom exceptions
21. Creating a Class which performs Basic Calculator Operations and invokes each operation using an object.
22. Creating a class "employee" with fields name, id, designation, salary. Initialize N employees and print details of N employees. Use self and__init_() method.
23. Demonstrate on single-level and multi-level inheritance.
24. Demonstrate on operator overloading, method overloading, method overriding
25. Programs to illustrate a few built-in library functions.

Textbook:

1. Reema Thareja, *"Python programming using problem solving approach ",* Oxford university press.

References Books*:*

1. Mark Summerfield, "*Programming in Python 3:A Complete Introduction to the Python Language"*,2nd edition, Addison-Wesley
2. Martin C. Brown*," PYTHON: The Complete Reference",* McGraw-Hill, 2001.
3. E Balagurusamy,"*Introduction to Computing and Problem Solving Using Python",* McGrawHill

B.E. (CivilEngineering) III– SEMESTER

S. No.	Course Code	Course Title	Scheme ofInstruction				Scheme of Examination			Credits
			L	T	Pr/ Drg	Contact Hrs/ week	CIE	SEE	Duration of SEE (Hrs)	
Theory Courses										
1	U21HSN02EG	Effective Technical Communication inEnglish	2	-	-	2	30	70	3	2
2	U21BSN03MT	EngineeringMathematics-III	3	-	-	3	30	70	3	3
3	U21ES301CE	Surveyingand Geomatics	3	-	-	3	30	70	3	3
4	U21PC301CE	EngineeringGeology	3	-	-	3	30	70	3	3
5	U21PC302CE	FluidMechanics	3	-	-	3	30	70	3	3
6	U21PC303CE	Strength of Materials - I	3	-	-	3	30	70	3	3
7	U21MCN01CE	EnvironmentalScience	2	-	-	2	30	70	3	0
Practical/ Laboratory Courses										
8	U21ES381CE	Surveying Lab	-	-	2	2	25	50	3	1
9	U21PC381CE	Engineering Geology Lab	-	-	2	2	25	50	3	1
10	U21PC382CE	FluidMechanics Lab	-	-	2	2	25	50	3	1
		Total	**19**	**-**	**6**	**25**	**285**	**640**		**20**

Service Courses: CSE, ECE

S. No.	Course Code	Course Title	Scheme ofInstruction				Scheme of Examination			Credits
			L	T	Pr/Drg	Contact Hrs/ week	CIE	SEE	Duration of SEE (Hrs)	
Practical/ Laboratory Courses										
1	U21MCN01CE	EnvironmentalScience	2	-	-	2	30	70	3	0

B.E. (CivilEngineering) IV– SEMESTER

S. No.	Course Code	Course Title	Scheme ofInstruction				Scheme of Examination			Credits
			L	T	Pr/ Drg	Contact Hrs/ week	CIE	SEE	Duration of SEE (Hrs)	
Theory Courses										
1	U21HSN01CO	Finance and Accounting	3	-	-	3	30	70	3	3
2	U21ES401EE/ME	Basic Electricaland Mechanical Engineering	3	-	-	3	30	70	3	3
3	U21PC401CE	Strength of Materials - II	3	-	-	3	30	70	3	3
4	U21PC402CE	Hydraulic Engineering	3	-	-	3	30	70	3	3
5	U21PC403CE	Design of RCC Structures - I	3	-	-	3	30	70	3	3
6	U21PC404CE	SoilMechanics	3	-	-	3	30	70	3	3
Practical/ Laboratory Courses										
7	U21PC481CE	Hydraulic Machines Lab	-	-	2	2	25	50	3	1
8	U21PC482CE	Strength of Materials Lab	-	-	2	2	25	50	3	1
9	U21PC483CE	Soil Mechanics Lab	-	-	2	2	25	50	3	1
		Surveying Camp *								
		Total	**18**	**-**	**6**	**24**	**255**	**570**		**21**

*To be conducted after theIVSemester in theSummer Vacation and to be evaluated in VSemester

Service Courses: EEE

S. No.	Course Code	Course Title	Scheme ofInstruction				Scheme ofExamination			Credits
			L	T	Pr/ Drg	Contact Hrs/ week	CIE	SEE	Duration of SEE (Hrs)	
Practical/ Laboratory Courses										
1	U21MCN01CE	Environmental Science	2	-	-	2	30	70	3	0

Course Code	CourseTitle						Core/Elective
U21HSN02EG	**Effective Technical Communication in English (Commonto all branches)**						Core
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
----	2	-	-	-	30	70	2

Course Objectives: To facilitatethestudents to learn the

- Features of Technical Communication
- Types of Professional Correspondence
- Techniques of Proposaland Report Writing
- Basics of Manual Writing
- Aspects of data interpretation with the help of visualaids

CourseOutcomes: After completing this course, students will beable to:

1. Handletechnical communication effectively
2. Usedifferent types of professional correspondence
3. Usevarious techniques of writing to generateproposals andreports
4. Acquireadequateskills of manual writing
5. Enhancetheir skills of information transfer using variety of visualaids

Unit I - Introductionto Communication: General & Technical

- General Communication: Introduction, Process, Types, Flow/Channels of communication, Barriers to Communication
- Technical Communication: Introduction, Process, Types, Features – Accuracy, Precision, Brevity, Clarity, Format, Layout & Style, Use of Visual Aids
- Differences between General writing and Technical writing

Unit II -Technical Writing 1 - InformationTransfer

- InformationTransfer - Introduction & Types
- Verbal to Non – verbal
- Non-verbal to Verbal
- VisualAids: Significance & Classification in Data Interpretation, Use of Graphic Organizers

Unit III -Technical Writing 2 - Official Correspondence

- Introduction of various types of correspondence: Format, Layout, Style& Etiquette
- Emails
- Inter OfficeCorrespondence– Circulars, Agendas, Minutes of Meetings, Memos
- Business Letters – Sales Letters, Credit Letters, Cover letters /Job Applications, CV& ResumeWriting

Unit IV -Technical Writing 3- Report Writing

- Proposals
- Feasibilityreport
- Progress report
- Project report
- Draftinga Scientific Paper

Unit V - Technical Writing 4- Manual Writing

- Manuals – Introduction & Types
- User /Instruction manual/ Owner's Guide
- Product manual

Suggested Reading:

1. ***Technical Communication: Principlesand Practice****, OUP,* ***Raman, Meenakshi & Sharma, Sangeeta***. 3rd Edition, 2015 & 2021.
2. ***Effective Technical Communication****,* Tata Mc GrawHill Education. ***Rizvi, Ashraf, M.*** 2nd Edition, 2017.
3. ***Business Correspondence & Report Writing: A Practical Approach to Business &Technical communication****,* Tata Mc GrawHill Education, ***Sharma, R.C., & Mohan, Krishna***. 4th Edition, 2017
4. ***Advanced Technical Communication****,* PHI Leaning. ***Tyagi, Kavita& Misra, Padma****,* 2011.
5. ***Applied Writing for Technicians****,* McGraw-Hill Higher Education, Jung K, Dale, 2004
6. ***Guideto Managerial Communication: Effective Business Writing andSpeaking,*** Pearson, ***Munter, Mary****,* 2011
7. ***Basic communication Skills for Technology****,* Pearson Publications, ***Andrea J Ruther Foord,*** 2 nd Edition, 2006
8. ***Managerial Communication*** *– Strategies and Applications,* Mc Graw Hill, ***Geraldine E Hynes***, 2010.
9. ***LittleRed Books – Modern Writing Skills****,* Rupa Publications, ***Terry O'Brien,*** 2012.
10. ***Oxford Guide to Plain English****, OUP,* ***Martin Cutts*** . 2013.

Course Code	Course Title						Core/Elective
U21BSN03MT	**Engineering Mathematics - III (Common to all branches)**						Core
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
----	3	-	-	-	30	70	3

Course Objectives: To facilitate the students to

- Introduce the basic concepts of probability
- Study the concepts of discrete and continuous probability distributions
- Introduce and study the concepts of fitting of curves, Correlation and Regression
- Study the concepts of testing of hypothesis for small samples

Course Outcomes: After completing this course, students will be able to:

1. Solve the problems by using the concepts of probability and random variables
2. Determine the statistical parameters for discrete probability distributions
3. Determine the statistical parameters for continuous probability distributions
4. Solve problems on curve fitting, correlation and lines of regression
5. Test the hypothesis for small samples

UNIT-I

Probability: Introduction to Probability, Conditional Probability, Theorem of Total probability, Bayes Theorem and its applications, Random variables, Types of random variables, Probability mass function and Probability density function, Mathematical expectation, variance.

UNIT-II

Discrete probability distributions: Introduction to Binomial and Poisson distributions, evaluation of statistical parameters -mean, variance, moment generating function, moments, skewness and kurtosis by central moments.

UNIT-III

Continuous probability distributions: Introduction to Uniform, Normal distributions, evaluation of statistical parameters - mean, variance, moment generating function, moments, skewness and kurtosis by central moments, Central limit theorem(without proof)

UNIT-IV

Correlation and Regression: Fitting of straight line, second degree Parabola and Power curves. Correlation, Regression and Rank correlation.

UNIT-V

Tests of significance: Small Samples-Introduction, Test of Hypothesis, t-test for single mean, difference of means, F-test for ratio of variances, Chi-square test for goodness of fit.

Text books:

1. ***Advanced Engineering Mathematics***, Narosa Publications, ***R. K. Jain & S. R. K. Iyengar,*** 2002
2. ***Higher Engineering Mathematics***, Khanna Publications, ***B. S. Grewal,*** 1965
3. ***Fundamentals of Mathematical Statistics***, S. Chand Pub, ***S.C. Gupta & V. K. Kapoor,*** 2002

Reference Books:

1. ***A text book of Engineering Mathematics***, Laxmi publications, ***N. P. Bali, &M. Goyal*** , 2010.
2. ***Introduction to Probability Theory***, Universal Book Stall, ***P. G. Hoel, S. C. Port & C. J. Stone***, 2003.
3. ***An Introduction to Probability Theory and its Applications***, Wiley, ***W. Feller***, Vol. I, 1968.

CourseCode	CourseTitle						Core/ Elective
U21ES301CE	**Surveying and Geomatics**						**Core**
Prerequisite	Contact Hours Per Week				**CIE**	**SEE**	
	L	T	D	P			Credits
	3	-	-	-	**30**	**70**	**3**

Course Objectives: Theobjective of this course is to impart knowledgeto

- Learnthebasic concepts types of surveying and Geomatics in civil engineering
- Get exposureto various modern surveying instruments and their use in different civil engineering applications.
- Develop various mapsrequired for civil engineering applications.

Course Outcomes: Onsuccessful completion of thecourse, students will beableto

1. Understand thebasic principles of surveying and different methods of surveying to computethe lengths, areas, bearings and levels of given field work using various instruments.
2. Measurehorizontal and vertical angles using theodolite and determine elevations of given objects using trigonometric levelling.
3. Computedata toset horizontaland vertical curves onthe field.
4. Operate modern surveying instruments liketotal station and global positioning system(GPS).
5. Applytheconcepts of Photogrammetric, Remotesensing for civil engineering works.

UNIT-I

Introduction to Surveying: Principles and objectives of surveying, classification, Chain Survey-concepts of Survey lines, offsets, errors in chain survey, cross staff survey-Concepts of Compass Survey, bearings, local attraction- Planetablesurvey accessories andradiation and intersection methods.

Levelling: Principles, Types of levelling, terms used in levelling, booking and reduction of levels using Height of Instrument, Riseand fall methods

Contouring: Definition of contours, characteristics, contour interval, methods of contouring, interpolation and uses of contour maps, estimation of areas andvolumes usingTrapezoidal and Simpson's methods

UNIT-II

Theodolite survey: Definitions and terms; Fundamental lines; Temporary Adjustments; Measurement of horizontal and vertical angle; Coordinates & their computations, Omitted measurements, Gales Traverse Table; Trigonometric levelling: Calculations of elevations and distances of accessible and inaccessible objects by single and doubleplane methods.

UNIT-III

Curves: Designation of curves, Elements of simple curve and setting out of simple curves by linear and angular methods; Elements of simple compound curve & Reverse curve; Elements of Transition curve: length of transition curve; Vertical Curves-Length of vertical curve- Elements of Summit and sagcurves.

UNIT-IV

Modern Field Survey Systems: Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Total Station – Parts of a Total Station – Accessories –Advantages and applications, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems-Segments, GPS measurements, Surveying with GPS.

UNIT-V

Photogrammetric Surveying: Introduction, Basic concepts, perspective geometry of aerial photograph,relief and tilt displacements, flight planning; Stereoscopy.

Remote Sensing: Introduction – Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphereand earthsurface, remotesensing data acquisition: platforms and sensors; visual imageinterpretation.

Text Books:

1. ***Surveying Vol–I & II***, Tata McGraw Hill Publishing, ***Duggal S K***, 2017
2. ***Surveying Vol-I, II and III***, Standard Book House, ***Arora,K.R***.,2015.
3. ***Surveying Vol-I, II and III***, Lakshmi Publishers, ***B.C.Punmia***, 2005.
4. ***Surveying & Levelling***, Pune Vidyarthi Griha Prakashan, ***TP Kanetkar and S VKulkarni***, 2017
5. ***Surveying & Levelling***, McGraw-Hill Education, ***Basak, N.N***, 2014.

Reference Books:

1. ***Plane and Geodetic Surveying***, ***John Eric.,Clark,David***.1972.
2. ***Surveying***, Wiley India, ***McCormac***, 6th Edition, 2012
3. ***Remote Sensing and Image Interpretation***, John Wiley & Sons, ***T.M. Lillesand and R.W.Kiefer***,1994
4. ***Higher Surveying***, New AgeInternational (P) Limited, ***A.M.Chandra***, 2002
5. ***Remote Sensing and Geographical Information System***, B.S.Publications, ***M.Anji Reddy***, 2001

CourseCode	CourseTitle						Core/ Elective
U21PC301CE	**Engineering Geology**						**Core**
Prerequisite	Contact Hours Per Week				**CIE**	**SEE**	
	L	T	D	P			Credits
----	3	-	-	-	**30**	**70**	**3**

Course Objectives: Theobjectives of this courseis toimpart knowledge of

- Mineralogy, rock formation & types and geological structures
- Rockweathering, formation& classification of soils
- Geomorphology and rock mechanics
- Utility of rocks asa construction material with qualifying properties
- Geological problems associated with dams, reservoirs, tunnels and other geological hazards

Course Outcomes: After completing this course, students will beableto

1. Identify various minerals, rocks andanalyze geological structures.
2. Understandrock weathering, classification of various soils and hydrogeology.
3. Classify landforms based on their geomorphology and evaluatethe engineering properties of rocks**.**
4. Examinerocks for their suitability in various Civil Engineering applications.
5. Identify thegeological problems in tunnels andcauses of earthquakes & landslides.

UNIT-I

Introduction to Geology: Engineering geology, Mineralogy, Peterology, Structural Geology, Geophysics, Hydro Geology, Rock Mechanics, Photo Geology and Geomorphology.

Mineralogy: Mineral, Origin and composition. Physical properties of minerals, susceptibility of minerals to weathering, Rock forming minerals.

Peterology: Classification of rocks: Igneous, sedimentary and metamorphic. Geological description and Indian occurrence of Granite, Basalt, Dolerite, Gabbro, Laterite, Sandstone, Shale, Limestone, Slate, Gneiss, Quartzite, Marble, Khondaliteand chamockite.

Structural Geology: Introduction, Classification of Folds, Causes of Folding, Parts of Faults, Classification of Faults, Recognition of Faults, Causes of joints, Classification of Joints, Formation of Unconformity, Types of Unconformity.

UNIT-II

Rock Weathering: Definition**,** process, types and end-products of Rock Weathering. Susceptibility of rocks to weathering, Laboratory Tests for assessing Intensity of Weathering. Engineering Classification of weathered Rock masses.

Geology ofSoils: Soil Formation, geological classification of soils, Soil deposits of India.

Hydrogeology: Hydrologic cycle, water table, types of aquifers, occurrence of ground water in various lithological formations, geophysical exploration of ground water.

UNIT–III

Geomorphology: Fluvial processes, Stream Erosion and sediment transport, Fluvial landforms, Eolian processes and deposits, Glacial Erosion and deposits, Dessert processes and landforms.

Rock Mechanics: Engineering properties of rocks, classification of Rock masses, Elastic properties: Young's Modulus and Poisson's Ratio, Stress-Straincurvefor Rocks in Uniaxial compression.

Site Investigation: Methods: Geological Investigation and mapping, remote sensing space and air photo studies and interpretation.

UNIT- IV

Rock as a Construction Material: Geological considerations for the selection of Building Stones, Ornamental Stones, Stones for Fire proof structures, Flooring and roofing stones, Paving stones, Mineral aggregates, road metal Concreteaggregates.

Geology of Dams: Dam -Parts and terminology, Types of Dams, Selection of Dam types, Geological parameters of Damsafety, Geology of Damsites, Dams on Igneous, sedimentary andfolded rocks.

Reservoirs: Geological Parameters, Reservoir problems, Geology of Reservoir sites.

UNIT–V

Tunnels: Terminology and definitions, Geological parameters of rock tunneling, cross sections of tunnels, problems of rock tunneling, tunneling through stratified rocks.

Geological Hazards: Landslides: Definition and terminology, classification of landslides, landslide hazards, causes and control measures of landslides. Earthquake: Definition and terminology, magnitude and intensity, causes of earthquake, seismic zones of India.

Text Books:

1. ***Engineering Geology***, Vikas Publications, **D. Venkat Reddy**, First Edition 2010
2. ***Engineering Geology***, Dhanpat Rai& CO. publications, **B.S. Sathya narayanswami**, Edition 01, 2000
3. ***Principles of Engineering Geology***, BS Publications, **K VG K Gokhale**, Revised Edition 2019
4. ***Principles of Engineering Geology & Geotechnics***, CBS Publishers & Distributors, **Dimitri P. Krynine and WilliamR. Judd,** 2018

Reference Books:

1. **Engineering Geology**, Wiley publications, **A. Parthasarathy, V. Panchpakesan and R. Nagarajan**, 2013
2. ***Engineering Geology*****,** Elsevier publications, **F.G. Bell**, 2007.

Course Code	Course Title						Core/ Elective
U21PC302CE	**Fluid Mechanics**						Core
Prerequisite	Contact Hours per Week				**CIE**	**SEE**	Credits
	L	T	D	P			
----	3	-	-	-	**30**	**70**	3

Course Objectives: The objective of this course is to impart knowledge in

- Fluid properties, pressure measurements and applications in fluid statics.
- Fluid kinematics, including types of flows, pathlines and continuity equations.
- Principles of fluid dynamics and applications
- Measurement of Velocity and discharge in Pressure conduits and free surface flows
- Basic concepts of compressible flow

Course Outcomes: After completing this course, students will be able to

1. Evaluate the fluid properties and hydrostatic forces on various surfaces
2. Understand various aspects of fluid kinematics and apply law of conservation of mass in fluid flow
3. Formulate equations based on energy and momentum principle
4. Determine measurement of Velocity and discharge using various devices
5. Understand the concepts of compressible flow

UNIT - I

Fluid Properties: Basic Concepts and Definitions: fluid continuum, ideal and real fluid, Mass density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; vapour pressure, boiling point, cavitation; compressibility; Surface tension and capillarity.

Fluid Statics: Fluid Pressure: Pressure at a point, Pascal's law, Piezometer, Manometer, Differential Manometer, Pressure gauges, Hydrostatic forces on plane and curved surfaces.

UNIT – II

Fluid Kinematics: Classification of fluid flow: Steady and unsteady flow, uniform and non-uniform flow, laminar and turbulent flow, rotational and irrotational flow, one, two and three-dimensional flows. Acceleration of a fluid particle, Definition of free and forced vortex motion, streamline, path line, streak line and stream tube, Continuity equation along a stream tube and in Cartesian coordinates. Circulation and vorticity, velocity potential function, streamfunction and flow net.

UNIT – III

Fluid Dynamics: Introduction, Equation of Motion: Euler's equation in Cartesian coordinates and along a stream line, Bernoulli's equation. Impulse momentum principle – application on pipe bend.

UNIT – IV

Flow Measurement*:* Velocity measuring device: Pitot Tube. Discharge measure in devices for pipe flows: Venturimeter, Orifice meter, Flow nozzle.

Weirs and Notches – Rectangular, Triangular, Trapezoidal, Submerged and Broad crusted weirs, Flow through Orifices and Mouthpieces: Free discharging Orifice and mouthpiece

UNIT – V

Compressible Flow: Introduction, Basic thermodynamic relation: Perfect Gas Equation. Definition of Isothermal process, adiabatic process and specific heat. Basic equation of compressible flow: one and three dimensional continuity and energy equation. Propagation of disturbance in fluid: Speed of sound or pressure waveand Mach number, Types of Flow.

Text Books

1. ***Hydraulics & Fluid Mechanics including Hydraulic Machines***, Standard Book publishers**, P M Modi and S MSeth**, 22 edition, 2018
2. ***Fluid Mechanics and Hydraulic Machines,*** McGrawhill**, K. Subramanya,** II edition, 2018
3. ***Engineering Fluid Mechanics***, Eurasia Publishing, K.L.Kumar ,2009

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Reference Books

1. **A first course in Fluid Mechanics**, University Press, **S. Narasimhan**, I edition, 2006
2. **Fluid Mechanics and Machinery**, Oxford University Press, **C.S.P. Ojha, R.Berndtsson, P.N. Chandramouli**, 2010
3. ***Fluid Mechanics and Fluid Machines***, *Tata McGraw-Hill Publishing*, ***S. K. Som, and Biswas, G***,II edition, 1998

CourseCode	CourseTitle						Core/ Elective
U21PC303CE	**Strengthof Materials-I**						**Core**
Prerequisite	Contact Hours per Week				**CIE**	**SEE**	
	L	T	D	P			Credits
Engineering Mechanics	3	-	-	-	**30**	**70**	3

Course Objective: Theobjective of this courseis toimpart knowledge in

- Determination of stress and strain for different materials and applications to longitudinally stressed bars.
- Evaluating shear forces and bending moments in beams, purebending theory, and determination ofbendingstresses inbeams.
- Determining the shearing stresses for different cross sections and also on the combined action of direct load and bending moment.
- Evaluation of principal stresses in multi-axially loaded members, and evaluation of stresses& strains in pressurevessels.
- Analysis of trusses using various methods

Course Outcomes: After completing this coursethestudents, will beableto

1. Apply the fundamental concepts of stress and strain in the analysis and design of axially loaded members.
2. Analyze beams to determine shear forces, bending moments and determine the bending stress distribution in beams.
3. Determine theshear stress distribution in beams and also the stresses in members subjected to combined axial and bending stresses.
4. Analyze the compound stresses at a point to evaluate principal stresses, and their applications to pressure vessels.
5. Analyzeforces in members ofa truss using method of joints and method of sections.

UNIT – I

Simple Stresses and Strains: Definitions, Types of Stresses: Tensile, Compressive and Shear Stresses. Hooke's Law, Modulus of Elasticity, Stress- Strain diagram for Mild steel, working stress and factor of safety, deformation of Bars of uniform, varying and tapering sections under axial loads. Compound sections andtemperaturestresses, Poisson's ratio, volumetric strain, relationship between Elastic constants.

UNIT – II

Shear Force and Bending Moment: Different types of beams and loads, shear force and bending moment diagrams for cantilever and simply supported beams with and without over hangs, subjected to point loads, uniformly distributed loads, uniformly varying loads andcouples.

Bending Stresses in Beams: Assumptions in theory of simple bending, Derivation of bending equation, Moment of resistance, calculation of stresses in statically determinate beams for different types of loads and different cross sections.

UNIT – III

Shear Stresses inBeams: Equation for shear stress, shear stress distribution across rectangular, circular, T andI section.
Direct and Bending Stresses: Eccentric loading**,** middlethird rule, core of rectangular and circular sections.

UNIT– IV

Compound Stresses: Stresses on oblique planes, principal stresses and principle planes. Construction of Mohr's circle of stress.

Thin & Thick cylinders: Thin cylinders subjected to internal fluid pressure, volumetric change. Thick Cylinders: Lame's equations, stresses under internal and external fluidpressures.

UNIT –V

Analysis of Perfect Frames: Perfect, deficient and redundant Frames, Assumptions, Method of joints and Methodof sections for Cantilever andsimply supported Trusses.

Text Books:

1. ***Strength of Materials and Theory of Structures,*** Laxmi Publishers, ***B.C. Punmia***, 2000.
2. ***Strength of Materials- A Practical Approach***, Universities Press, ***D.S. Prakash Rao***, 1999.
3. ***Strength of Materials****, Dhanpat Rai Publishing Company* , ***S. Ramamrutham, R Narayanan****, 2011.*

Reference Books:

1. ***Mechanics of Materials***,Tata McGraw-Hill, ***Ferdinand PBeer, Johnstonand DeWolf***, 2004.
2. ***Strengthof Materials***, Oxford University Press, ***R. Subramanian***, New Delhi 2005.

Course Code	CourseTitle						Core/Elective
U21MCN01CE	**Environmental Science**						**Mandatory**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
----	**2**	**-**	**-**	**-**	**30**	**70**	**0**

Course Objectives

- To create awareness and impart basic knowledge about the environment and its allied problems.
- To know the significance and functions of ecosystem.
- To understand importance of biological diversity.
- To study different forms of pollution and their impact on environment.
- To know social and environment related issues and their preventive measures.

Course Outcomes: After completing this course, students will be able to:

1. Develop an attitude of concern towards the environment.
2. Understand the importance of ecosystem.
3. Conservation of natural resources and biological diversity.
4. Develop knowledge on Environmental pollution and Environmental loss
5. Adopt environmental ethics to attain sustainable development

UNIT –I

The Multidisciplinary Nature of Environmental Studies: Definition, scope and importance, need for public awareness.

Natural Resources: Water Resources – Use and over utilization of surface and ground water, flood, drought, conflicts over water, Dams: Benefits and Problems. Food Resources–World Food Problems, effects of modern agriculture, fertilizer-pesticides problems, water logging, salinity, Forest Resources –Use and over exploitation, deforestation & its effect on tribal people. Land Resources–Land Degradation, soil erosion and desertification**.** Energy Resources –Growing energy needs, Renewable and Non-renewable energy resources.

UNIT –II

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in ecosystem, food chains, ecological pyramids, ecological succession, types of ecosystems (marine, pond, river, forest, grassland, desert).

UNIT –III

Biodiversity: Levels of Biodiversity, Bio-geographical classification of India, Value of biodiversity, Threats to biodiversity, endangered and endemic species of India, Conservation of biodiversity.

UNIT –IV

Environmental Pollution: Definition, Causes, effects and control measures of air pollution, water pollution, Soil pollution, noise pollution, thermal pollution, solid waste management

Environment Protection Act: Air, water, forest and wildlife Acts, issues in the enforcement of environmental legislation.

UNIT –V

Social Issues and the Environment: Watershed management and environmental ethics. Cimate change, global warming, acid rain, ozone layer depletion.

Environmental Disaster Management: Types of disasters, impact of disasters on environment, infrastructure, and development. Disaster management cycleand disaster management in India.

Text books:

1. ***Environmental Chemistry***, WileyEastern Ltd, ***A.K.De***, 2016.
2. ***Fundamentals ofEcology***, W.B. Sunders Co.,***E.P.Odum***, 2017
3. ***WasteWater Treatment,*** Oxfordand IBK Publications, ***M.N. Rao andA.K.Datta***, 2020
4. ***Environmental Studies***,Tata McGrawHill, ***Benny Joseph***, 2005.
5. ***Disaster Management***, NationalCentrefor Disaster Management, IIPE, ***V.K.Sharma***,1999.

Course Code	CourseTitle						Core/Elective
U21ES381CE	**Surveying Lab**						**Core**
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
----	**-**	**-**	**-**	**2**	**25**	**50**	**1**

Course Objectives: During thecourse, student is expected to

- Study thedifferent methods used insurveying field work
- Knowtheuse of simpleand modern surveying instruments
- Studythebasic concept of trigonometrical levelling, and its fieldapplications
- Exploresetting of various types of curves.

Course Outcomes: On successful completion of this course, students will beableto:

1. Interpret horizontal measurements andcalculation of areas with the help of Chain & Tape inthefield
2. Estimate vertical measurement withthe help of levelling inthefield
3. Interpret horizontal angular measurements and distance using Compass Surveying in thefield
4. Handleadvanced survey instruments like Theodolite, Total station, GPS to carry out field marking andcurves setting.

List ofexperiments:

1. Determination of area of given landusingchain surveying.
2. Setting out a polygon usingprismatic compass (closedtraverse)
3. Planetablesurvey: Radiation & Intersection methods
4. Differential levelling using auto level
5. Profile levelling usingauto level
6. Measurement of horizontalangleusing Theodolite(Repetition and Reiteration method)
7. Measurement of verticalangles andreduced levels
8. Determination of reduced levels of objects in same vertical plane
9. Determination of reduced levels of objects in different vertical planes
10. Setting out of simplecircular curveusing linear method (perpendicular offsets fromthe long Chord method)
11. Setting out of simplecircular curveusing angular method (Rankine's method)
12. Determination of thearea of a closedtraverse(min. 5 stations) using total station
13. Determination of latitude and longitude of four stations and computation of thearea using GPS

Note: At least 10 experiments must beperformed duringthesemester

References:

1 http://nptel.ac.in/
2 http://mhrd.gov.in/e-contents
3 http://vlab.co.in/

Course Code	Course Title						Core/Elective
U21PC381CE	**Engineering Geology Lab**						**Core**
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
----	**-**	**-**	**-**	**2**	**25**	**50**	**1**

Course Objectives: During the course, student is expected to know

- Physical and engineering properties of minerals and rocks
- Exposure to various aspects of geological and geotechnical maps of India
- Electrical and Seismic site investigation methods
- Degree of weathering using slate durability test.

Course Outcomes: On successful completion of this course, students will be able to:

1. Identify the physical and engineering properties of minerals and rocks
2. Analyze and measure structural aspects of rocks using models and clinometers compass
3. Carry out field experiment and studies such as VES
4. Study geological survey of India (GSI) maps
5. Estimate degree of weatherbility in soft rocks using Slake Durability apparatus.

LIST OF EXPERIMENTS

1. Identification and description of physical properties of minerals
2. Identification and description of geological and geotechnical characteristics of rocks
3. Study of structural geology models (wooden models)
4. Measurement of dip of planar feature by clinometer compass
5. Vertical electrical sounding (VES) field experiment
6 Seismic refraction survey to determine depth of bedrock
7. Study of topographical maps
8. Structural geology problems (strike, dip, three point problems)
9. Study of geological survey of India (GSI) maps and reports
10. Slake durability test on soft rock

Course Code	Course Title						Core/Elective
U21PC382CE	**Fluid Mechanics Lab**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
----	**-**	**-**	**-**	**2**	**25**	**50**	**1**

Course Objectives: The objective is to impart knowledge in

- Verifying the principles of continuity and Bernoulli's equations
- Various flow measuring devices for calculating coefficient of discharge.
- Identifying laminar and turbulent flow characteristics

Course Outcomes: On successful completion of this course, students will be able to:

1. Determine discharge flowing through Open Channels & Tanks
2. Determine discharge through pipes and losses in pipes.
3. Validate Bernoulli's principle.
4. Identify type of the flow by Reynolds Experiment
5. Practice working as a team member, demonstrate professional behavior and present the results effectively.

List of Experiments:

Cycle-I

1. Determination of coefficient of discharge of a Rectangular Notch with end contractions
2. Determination of coefficient of discharge of a Circular orifice
3. Determination of coefficient of discharge of a Mouthpiece
4. Determination of coefficient of discharge of V- Notch
5. Determination of coefficient of discharge of a Venturimeter

Cycle-II

6. Determination of coefficient of discharge of an Orificemeter
7. Classification of flow by Reynold's Experiment
8. Determination of Darcy's friction factor
9. Verification of Bernoulli's theorem
10. Determination of minor losses in pipes.

References:

1 http://nptel.ac.in/
2 http://mhrd.gov.in/e-contents
3 http://vlab.co.in/

Course Code	Course Title						Core/ Elective
U21HSN01CO	**Finance and Accounting**						**Core**
Prerequisite	Contact Hours per Week				**CIE**	**SEE**	
	L	T	D	P			Credits
----	3	-	-	-	**30**	**70**	3

Course Objectives: Thecourse will introducethestudents to

- Understandaccountingaspects of business.
- Understandfinancial statements.
- Understand financial system.
- Provideinputs necessaryto evaluatethe viability of projects.
- Providetheskills necessary to analysethefinancial statements.

Course Outcomes: After successful completion of the coursethestudents will beableto

1. Evaluatethefinancial performance of thebusiness unit.
2. Takedecisions onselection of projects.
3. Takedecisions of procurement of finances.
4. Analysetheliquidity, solvency and profitability of thebusiness unit.

UNIT-I

Basics of Accounting: Financial Accounting-Definition-Accounting Cycle–Journal-Ledger -Cash Book– Bank Reconciliation Statement and Trial Balance(including problems)

UNIT-II

Final Accounts: Trading Account-Profit and Loss Account-Balance Sheet (including problems with adjustments like Closing Stock, Expenses Outstanding, Prepaid Expenses, Income earned but not received, Income received in advance, Depreciation, Bad debts, Provision for Bad and Doubtful Debts, Provision for Discount on Debtors, Provision for Discount on Creditors, Interest on Capital, Interest on Drawings)

UNIT-III

Financial Statement Analysis: Importance-Users-Ratio Analysis-Liquidity, Solvency, Turnover & Profitability Ratios.

UNIT-IV

Capital Budgeting: Meaning – Importance - Time Value of Money-Discounting - Compounding-Financial Appraisal of Project – PaybackPeriod, ARR, NPV, PI, IRR (Simpleproblems)

UNIT-V

Financial Systemand Markets: Financial System-Financial Markets – Financial Institutions – Financial Instruments – Financial Intermediaries – RBI, SEBI and IRDA(Functions only)

Suggested Readings:

1. ***Accountancy – I***, Tata McGrahill Company, ***Haneef & Mukarjee***
2. ***Accountancy – I***: Kalyani Publishers, ***SP Jain& KL. Narang***
3. ***Advanced Accountancy – I***: Vikas Publishers, ***S.N. Maheshwari & V.L. Maheswari***
4. ***Financial Management*** – Vikas Publishers ***I.M. Pandey***
5. ***Financial Institutions & Markets*** – PBP, ***Prashanta Athma***

Course Code	Course Title						Core/ Elective
U21ES401EE/ME	**Basic Electrical and Mechanical Engineering**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Engineering Physics	**3**	-	-	-	**30**	**70**	3

Course Objectives: The course will introduce the students to

- Acquire knowledge in electrical circuits.
- Understand the basic principle, operation of electrical machines.
- Understand the various manufacturing processes like casting, welding, additive manufacturing.
- Understand 3D printing concepts and applications.

Course Outcomes: At the end of the course students will be able to

1. Analyze simple DC and AC circuits.
2. Illustrate the construction, operation of DC machines and AC machines.
3. Identify the Electrical Installation, Switchgear and Safety measures.
4. Describe the processes of casting, welding and concepts of additive manufacturing.
5. Estimate the power transmitted through belts and comprehend the working of earth moving machinery.

UNIT- I

DC Circuits: Electrical circuit elements (R, L and C), voltage source, Ohm's Law, Kirchhoff's current and voltage laws, analysis of simple circuits with DC excitation. Power loss in resistive elements.

AC Circuits:

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase AC circuits consisting of R, L, C, and RL, RC, RLC combinations (series only).

UNIT-II

Three-phase Circuits: Star and Delta connections under balanced conditions, Line & phase voltages and currents and three-phase power, advantages of three-phase system.

DC Machines: Construction and principle of operation of DC generator and DC motor, EMF equation, applications

Transformers: Principle and operation of single-phase transformer, losses and efficiency, applications.

UNIT- III

Single-phase Induction Motors: Construction and principle of operation, Capacitor start & capacitor run motor, applications

Three-phase Induction Motors: Construction and working, applications.

Electrical Installations: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, Types of Wires and Cables, Earthing.

Manufacturing Processes: Introduction to Casting, Principles of sand casting, Introduction to Welding, Principles of Arc welding and gas welding, Concepts of Soldering and brazing, Concept of Additive manufacturing, Principles of solid based Systems- Fused Deposition Modelling (FDM), Powder based systems- Selective Laser Sintering (SLS).

UNIT- IV

Belts and Rope Drives: Belts and Rope Drives**,** Open and closed belt drives, length of belt, ratio of tensions, effect of centrifugal tension and initial tension on power transmission, condition for maximumpower transmission.

Earth moving machinery and Mechanical handling equipment - Bull dozers - Power showels – Excavators -Concrete mixer - Belt andbucket conveyers

UNIT – V

Printing: Concept of 3-D printing and Additive manufacturing, Classification of systems- Liquid based, Solid based- Fused Deposition Modeling (FDM), Powder based systems- Selective Laser Sintering (SLS), Steps involved in Additive manufacturing, Data Formats: STL format, STL File Problems, STL file repairs; Software's features: Magics, Mimics, Solid View, View Expert, 3D Rhino, 3D doctor.

Text Books:

1. **I*ntroduction to Electrical Engineering***," Tata McGraw Hill, Naidu M.S. & Kamakshiah S., 1995
2. ***Basic Electrical Engineering,*** Tata McGraw Hill Education, A. Chakrabarti, Sudipta Nath, ChandanKumar Chanda, 2009.
3. ***Manufacturing Technology***, P.N.Rao, Volume 1, Tata Mcgraw Hill Publications, 3rd Edition, 2011.
4. ***Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping and Direct Digital Manufacturing***, IanGibson, DavidW Rosen, Brent Stucker, Springer Edition, 2010.
5. ***Theory of Machines***, S.S. Rattan,Tata McGraw-Hill, 5thEdition, 2019.
6. ***Mechanical Technology***, D H Bacon, R. C. Stephens, 2nd edition, 1990.

Reference Books:

1. ***Principles of Electrical Engineering and Electronics***", S.Chand & Co., Mehta VK, 2015
2. ***Manufacturing Science***, Amitabh Ghosh & Mallick, Assoc. East West Press Pvt. Ltd, 4th Edition, 2011.
3. ***3D Printing and Additive Manufacturing Principles and Applications***, Chee Kai Chua and KahFai Leong, FifthEdition, World Scientific.2016
4. ***Theory of Machines***, Thomas Bevan, Pearson Education, 2009
5. ***Construction Planning, Equipment and methods***, R. Peurifoy, Shapira, 7th edition, Tata McGrawHill. 2010

Course Code	Course Title						Core/ Elective
U21PC401CE	**Strength of Materials-II**						**Core**
Prerequisite	Contact Hours per Week				**CIE**	**SEE**	
	L	T	D	P			Credits
Engineering Mechanics & Strength of materials-I	3	-	-	-	**30**	**70**	3

Course Objectives: The objective of this course is to impart knowledge on

- Evaluating deflections of beams due to transverse loads by various methods.
- Analysis of indeterminate beams by applying the principles of equilibrium and compatibility equations
- Concept of strain energy principle and its application to evaluate the displacements and redundant forces
- Phenomenon of buckling of columns using Euler's formula, Rankine's and secant formulae.
- Pure torsion theory and application to different types of springs.

Course Outcomes: After completing this course the students, will be able to

1. Interpret the deflections of determinate beams due to transverse loads by various methods
2. Analyze statically indeterminate beams such as propped cantilever, fixed beams and continuous beams and draw shear force and bending moment diagrams
3. Analyze the beams and frames and to find deflections by energy principle.
4. Evaluate the crippling load of columns for various end conditions using different formulae.
5. Evaluate the stresses and strains of circular members subjected to torsion and calculate the power required for torsional revolutions of shafts.

UNIT – I

Deflection of beams: Slope and deflection by double integration method for cantilever, simply supported and overhanging beams carrying point loads, uniformly distributed and varying load over entire span. Moment area and conjugate beam method for simple cases.

UNIT– II

Propped cantilevers: Shear Force & Bending Moment diagrams and deflections for elastic and rigid propped cantilever beams subjected to point loads and uniformly distributed loads.

Fixed Beams: Shear Force & Bending Moment diagrams and deflections in fixed beams with and without sinking of supports subjected to point loads, uniformly distributed and uniformly varying loads.

Continuous Beams Shear Force& Bending Moment diagrams and elastic curve using theorem of three moments with and without sinking of supports

UNIT –III

Torsion of Shafts: Assumptions, Tortional Equation for circular sections**,** strength and stiffness of shafts, Transmission of Power, combined bending and torsion: Principal Stresses.

Springs: Types of springs and significance, close and open coiled helical springs under axial load and axial twist.

UNIT –IV

Strain energy: Definitions: Resilience, Proof Resilience and Modulus of Resilience. Strain energy in bars subjected to gradually applied, suddenly applied and impact loads. Strain energy due to shear, bending and torsion.

UNIT–V

Columns and Struts: Euler's theory for different end conditions of columns, effective length and limitations of Euler's formula, slenderness ratio. Rankine's Formula, Secant & Perry formula for eccentrically loaded columns.

Text Books:

1. ***Strength of Materials and Theory of Structures***, Laxmi Publishers, ***B.C. Punmia***, 2000.
2. ***Strength of Materials***, *Dhanpat Rai Publishing Company*, ***S. Ramamrutham, R. Narayanan***, 2011.
3. ***A text book of Strength of Materials***, Laxmi Publications, ***Bansal R.K,*** 2010
4. ***Strength of Materials, -A Practical Approach***, Universities Press, ***D.S. Prakash Rao***, 1999.

Reference Books:

1. ***Mechanics of Materials,*** Tata McGraw-Hill, ***Ferdinand P Beer, Johnston and DeWolf***., 2004.
2. ***Strength of Materials***, Oxford University Press, NewDelhi, ***R. Subramanian,*** 2005.

Course Code	Course Title						Core/ Elective
U21PC402CE	**Hydraulic Engineering**						**Core**
Prerequisite	Contact Hours per Week				**CIE**	**SEE**	
	L	T	D	P			Credits
Fluid Mechanics	3	-	-	-	**30**	**70**	3

Course Objectives: The objective of this course is to impart knowledge in

- Various hydraulic engineering problems - pipeflow and open channel flows.
- Dimensional analysis
- Principles of turbines and pumps.

Course Outcomes: After completing this course, students will be able to

1. Formulate equation for laminar and turbulent flows.
2. Analyze and design of open channels and perform non-uniform flow computations
3. Understand dimensional analysis and model studies.
4. Design turbines and understand performance characteristics curves
5. Describe various types of pumps, functioning and understand performance characteristic curves

UNIT – I

Flow through Pipes: Introduction**,** Reynolds experiment, Loss of fluid friction, Loss of head due to friction: Darcy Wiesbach formula. Energy and Hydraulic grade lines. Minor losses: Loss of head due to sudden enlargement and contraction. Pipes in parallel & series and equivalent pipes.

Laminar Flow: Laminar flow in circular pipes, Loss of fluid friction, Hagen - Poiseuille law.

Turbulent Flow: Definition and Prandtl's Mixing length Theory.

UNIT – II

Open Channel Flow – Comparison between open channel flow and pipe flow, Classification of open channel flow. Uniform Flow in open channels: Boundary Shear, Manning's and Chezy's formula, hydraulically efficient channel section. Non-Uniform Flow in open channels: Specific energy and critical depth, gradually varied flow, types of profiles and length of profiles, Hydraulic jump definition, types and characteristics.

UNIT – III

Dimensional Analysis and Hydraulic Similitude: Dimensional Homogeneity, Dimensional analysis: Rayleigh's method, Buckingham PI theorem. Similitude: Geometric, Kinematic and Dynamic similarities. Dimensionless flow parameters: Reynolds, Froude and Mach number. Model Scales, Distorted models.

UNIT – IV

Hydraulic Machines -Turbines: Force exerted by fluid jet on stationary and moving plates**,** Classification of turbines. Work done and efficiencies, working proportions and design of Pelton wheel, Francis turbine and Kaplan turbine. Draft tube theory cavitation phenomenon. Unit and specific quantities, Performance characteristics curves of turbines.

UNIT – V

Hydraulic Machines -Pumps: Classification**, C**entrifugal pumps: Components and working, work done by impeller, head of the pump, losses and efficiencies, minimum starting speed. specific speed, pumps in series and parallel, Performance characteristics curves. Reciprocating pumps: Classification, basic principles and operation.

Text Books

1. ***Hydraulics & Fluid Mechanics including Hydraulic Machines***, Standard Book publishers**, P M Modi and S M Seth**, 22 edition, 2018
2. ***Fluid Mechanics and Hydraulic Machines,*** McGrawhill**, K. Subramanya,** II edition, 2018
3. ***Engineering Fluid Mechanics***, Eurasia Publishing, ***K.L.Kumar*** ,2009

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Reference Books

1. **Fluid Mechanics and Machinery**, Oxford University Press, **C.S.P. Ojha, R.Berndtsson, P.N. Chandramouli**, 2010
2. ***Fluid Mechanics and Fluid Machines***, *Tata McGraw-Hill Publishing,* ***S. K. Som, and Biswas, G,*** *II edition, 1998*
3. ***Fluid Mechanics****, Khanna publishers,* ***A K Jain,*** 1998

Course Code	CourseTitle						Core/ Elective
U21PC403CE	**Design ofRCC Structures - I**						**Core**
Prerequisite	Contact Hours per Week				**CIE**	**SEE**	
	L	T	D	P			Credits
Engineering Mechanics	3	-	-	-	**30**	**70**	3

Course Objectives: Theobjective of this courseis to impart knowledge in

- Design of Reinforced ConcreteMembers using working stress method and limit state method
- Indian standard code of practice for reinforced concrete members
- Identifying theresponsibility of engineer in detailing of reinforcement of various RCCmembers.
- Developing anunderstanding of real-world design problems.

CourseOutcomes: After completing this course, thestudents will beableto

1. Adopt the design philosophies of working stress method and Limit state method and design a singlyand doubly reinforced sections using working stress method.
2. Designsingly, doubly and flanged reinforced sections using limit state method and check for limit state of serviceability.
3. Design Reinforced concrete beamfor shear, torsion and bond.
4. Design Reinforced concrete one way, two-wayand continuous slabs and design of slab type stair case
5. Design Short axially loaded columns and isolated rectangular Reinforced concrete footing.

UNIT – I

Reinforced Cement Concrete: Need for Reinforcement in Concrete**,** Stress - Strain curve for Concrete and steel, Concept of balanced, under-reinforced and over reinforced sections. Design philosophies: Working stress method and limit state method. Classification of limit states, characteristic strength of materials, characteristic loads, partial safety factors, stress block parameters. Analysis and design of singly and doublyreinforced rectangular sections using working stress method.

UNIT – II

Limit state of Collapse – Flexure: Assumption, Analysis and design of singly reinforced, doubly reinforced rectangular beams and singly reinforced flanged beams.

Limit states of serviceability: Short term, long term, total deflection, Check for deflection, cracking and IS codeprovisions.

UNIT – III

Limit State of Collapse in Shear and Torsion: Design of RC members for Shear and Torsion. Bond, development lengthand curtailment of reinforcement in beams and detailing of bars: IS codeprovision.

UNIT– IV

Design of Slabs: Types of Slabs: Design of one way, two-way slabs, Simply supported and continuous solid rectangular slabs subjected to uniformly distributed loads. Detailing of reinforcement and check for serviceability of slabs, design and detailing of dog-legged slab typestair case.

UNIT –V

Limit state of Collapse in Compression: Design and detailing of axially loaded rectangular and circular short columns with helical reinforcement. Uni-axial and bi-axial bending - interaction diagrams

Designof footings: Design of isolated squareand rectangular footings, design &Detailing of axially loaded isolatedrectangular footing as per IS codeprovisions.

***T*ext Books:**

1. ***Design of Concrete Structures***, McGraw Hill, ***David Darwin, Charles W. Dolan, Arthur H. Nilson***, 15th Edition, 2016.
2. ***Reinforced Concrete- Limit State Design***, Nem Chand and Bros publications, ***A.K Jain***, 7th edition 2012.
3. ***Reinforced concrete structures***, Laxmi Publications,***B.C. Punmia***, 7th Edition, 1992
4. ***Reinforced Cement concrete Design***, S.K. Kataria and Sons publications, ***Neelam Sharma***, 2017

Reference Books:

1. ***Reinforced Concrete Design***, New Age International Pvt. Ltd., ***Krishna Raju N. and Pranesh R.N*** 2003.
2. ***Reinforced Concrete (Elementary reinforced concrete),*** Charotar Publications, ***H. J. Shah,*** 11th Edition, Volume I, 2016.

Relevant IS Codes:

1. IS: 456-2000, *"Code of Practice for Plain and Reinforced concrete",* Bureau of Indian Standards, NewDelhi, India.
2. SP 16, *"Design Aids for Reinforced Concrete to IS 456:1978",* Bureau of Indian standards, New Delhi, India
3. SP 24, *"Explanatory Handbook on Indian Standard Code of Practice for Plain and Reinforced Concrete to IS 456:1978",* Bureau of Indian Standards, New Delhi, India
4. SP 34, *"Handbook on Concrete Reinforcement and Detailing(With Amendment I)",*Bureau of Indian Standards, NewDelhi, India
5. IS: 875-1987, *"Code of Practice For Design Loads (Other Than Earthquake)* for buildings *And Structures Parts (1, 2, 3, 4 &5)",* Bureau of Indian Standards, New Delhi, India.

Course Code	Course Title						Core/ Elective
U21PC404CE	**Soil Mechanics**						**Core**
Prerequisite	Contact Hours per Week				**CIE**	**SEE**	
	L	T	D	P			Credits
-	3	-	-	-	**30**	**70**	3

Course Objectives: The objective of this course is to

- Introduce particulate mechanics, to characterize and classify soils
- Impart knowledge on seepage and effective stress principles
- Get exposure on compressibility characteristics and consolidation settlements of soil.
- Learn shear parameters by different methods at different drainage conditions.
- Experience the concepts of earth pressures and stability of slopes.

Course Outcomes: After completing this course, the students will be able to

1. Characterize and classify the soils based on laboratory and field experiments
2. Understand permeability and seepage characteristics of soils and analysis of applications involving them
3. Understand Compressibility characteristics of soils and compute the consolidation settlements
4. Evaluate shear parameters of soil through various shear tests.
5. Determine magnitude and direction of earth pressure and analyze stability of slopes

UNIT – I

Preliminary Definitions and Relationships: Soil as a three phase system, Weight ratios: Water content, Density, Unit weights, Specific Gravity; Volume ratios: void ratio, porosity, degree of saturation, relative density; Interrelationships.

Determination of Index Properties: Water content, specific gravity, In-situ density by sand replacement and core cutter method, Relative density, particle size distribution by sieve analysis, Plasticity characteristics: Consistency limits, Shrinkage parameters.

Classification of Soils: Classification and Identification of soils for general and engineering purposes as per IS: 1498-1970.

UNIT – II

Soil moisture – Permeability and Capillarity: Soil moisture – modes of occurrence; Total, effective and neutral stresses distribution in different ground conditions; Darcy's law for flow through soils - validity of Darcy's Law - Factors affecting permeability - Laboratory tests for determination of co-efficient of permeability (constant head, variable head permeability tests) - Field tests (Pumping in and pumping out tests) - Equivalent permeability of stratified soils; Surface tension and capillary rise in soil, Capillary tension, Capillary pressure. pF value.

Seepage Analysis: Seepage flow, seepage pressure - Flow nets - Locating phreatic line in a homogeneous earthen dam using Kogeny's parabola - Computation of seepage quantity; Quick Sand phenomena, Critical Hydraulic gradient, Remedial measures.

UNIT – III

Compaction of Soils: Compaction phenomenon, determination of compaction characteristics-standard and modified Proctor tests- IS Light and heavy compaction tests; factors affecting compaction, Effect of compaction on soil properties, Field compaction: compaction equipment, procedure, quality control.

Consolidation of Soils: Stages of consolidation, Spring analogy, Laboratory consolidation test, Determination of void ratio, Void ratio and effective stress (e Vs log p) relationship – Terazaghi's theory of one dimensional consolidation - assumptions and derivation of GDE – Computation of magnitude of settlement and timerateof settlement.

UNIT – IV

Shear Strength: Principal planes and stresses, Mohr's circle, Mohr - Coulomb failure theory, drainage conditions, Laboratory tests for determination of shear strength - Direct shear test, Tri-axial compression test, Un-confined compression test, Vaneshear test, Factors affecting shear strength of soils.

UNIT –V

Earth Pressures: States of earth pressure - Active, passive & at rest condition; Rankine's theory: computation of active and passive earth pressure in soils, Coulomb's Wedge theory, Rehbhan's graphical solution.

Stability of slopes: Types of slopes and slope failures, Different factors of safety, Analysis of stability of slopeusing Swedish slip circle method, Stability chart, Taylor's stability number.

Text Books:

1. ***Geotechnical Engineering***, New AgePublishers, ***Venkataramaiah, C***., 2006.
2. ***Soil Mechanics and Foundation Engineering***, Standard Publishers Distributors, ***Arora, K.R.,*** sixth edition, 2007.
3. ***Soil Mechanics and Ffoundations,*** Laxmi Publications (P) Ltd, ***Punmia, B. C., Ashok Kumar Jainand Arun Kumar Jain***, 2005.

Reference Books:

1. ***Soil Mechanics***, John Wiley &Sons Inc., NY, ***Lambe, T.W. and Whitman, R.V***., 1969.
2. ***Geotechnical Engineering***, McGrawHill Publications, ***Donald. P. Coduto***, 2010
3. ***Soil Mechanics and Foundation Engineering***. Dhanpat Rai& Sons, ***Murthy, V.N.S.,*** 2006.
4. ***Foundation Engineering***, Tata McGraw Hill Publishing Company Limited, ***S.P. Brahma,*** New Delhi, 1985.

Course Code	CourseTitle						Core/Elective
U21PC481CE	**Hydraulic Machines Lab**						**Core**
Prerequisite	Contact Hours per Week				**CIE**	**SEE**	Credits
	L	T	D	P			
----	**-**	**-**	**-**	**2**	**25**	**50**	**1**

Course Objectives: Theobjective is to impart knowledgein

- Flowthrough open and curved channels.
- Forceconcepts on jets and hydraulic machines
- Characteristic curves for turbines and pumps.

CourseOutcomes: On successful completion of this course, students will beableto:

1. Understand flow phenomenon in open channels.
2. Analyzetheforceacting on stationary objects, its application in hydraulic machines.
3. Understand working principles of Hydraulic pumps and turbines.
4. Practiceworking as a team member, demonstrateprofessional behavior and present theresults effectively.

List of Experiments:

Cycle-I

1. Determination of Rugosity Coefficients.
2. Determination of a vanecoefficient for flat plate
3. Determination of a vanecoefficient for curved plate
4. Study of universal characteristic curves of a Pelton Wheel turbine
5. Study of maincharacteristic curves of a Centrifugal pump

Cycle-II

6. Study of universal characteristic curves of a Francis turbine
7. Study of flowCharacteristics over a broad crested weir
8. Determination of basic characteristics of a hydraulic jump
9. Verification of Froude's model law
10. Determination of critical slope of an open channel

References:

1 http://nptel.ac.in/
2 http://mhrd.gov.in/e-contents
3 http://vlab.co.in/

Course Code	Course Title						Core/Elective
U21PC482CE	**Strength of Materials Lab**						**Core**
Prerequisite	Contact Hours per Week				**CIE**	**SEE**	Credits
	L	T	D	P			
----	**-**	**-**	**-**	**2**	**25**	**50**	**1**

Course Objectives: The objective of this course is to impart knowledge on the

- Experiments on various materials to assess their behavior and limitations.
- Study of brittle and ductile material failure patterns.
- Shear force, bending moment and deflection for different types of beams.
- Experiments to find rigidity modulus by conducting spring and torsion test.

Course Outcomes: After completing this course the students, will be able to

1. Evaluate Young's modulus, rigidity modulus, hardness number, flexural rigidity and impact strength of given specimens.
2. Analyze the behavior of material (mild steel) in elastic, plastic, and elasto-plastic states before breaking/failure
3. Determine stiffness of close coiled helical springs.
4. Determine modulus of rigidity of given specimen by conducting the torsion test.

LIST OF EXPERIMENTS

1. Uni-Axial Tension Test on a Specimen of Mild Steel.
2. Verification of Shear Force.
3. Bending Test on Simply Supported Beam of Timber.
4. Bending Test on Cantilever Beam of Steel.
5. Rigidity Modulus of Material of the Spring.
6. Torsion test on a specimen of Ductile Material.
7. Brinell's Hardness Test.
8. Verification of Bending Moment.
9. Bending Test on Simply Supported Beam of Steel.
10. Bending Test on Continuous Beam of Steel.
11. Izod Impact Test.
12. Compression Test on Brick.

Course Code	CourseTitle						Core/Elective
U21PC483CE	**Soil Mechanics Lab**						**Core**
Prerequisite	Contact Hours per Week				**CIE**	**SEE**	Credits
	L	T	D	P			
----	**-**	**-**	**-**	**2**	**25**	**50**	**1**

Course Objectives: Theobjective of this course is to

- Exposestudents for laboratorytest procedures in calculating index properties.
- Exposestudents for laboratory test procedures in calculating engineering properties andsuitability of each test.
- Makethestudents torelatetheoretical concepts in doing lab tests

CourseOutcomes: On successful completion of this course, students will beableto

1. Performthelaboratory experiments onsoil specimen, analyze theresults, interpret and validate the same
2. Understandthesoil behavior by determining index properties
3. Performtests on engineering properties of soils and analyzethetest results.

List ofexperiments:

Cycle – I: Determinationof Index Properties

1. Determination of Specific Gravity of soil solids using Density bottle method
2. Determination of Specific Gravity of Soil Solids using Pycnometer method
3. Determination of water content usingPycnometer method
4. Determination of Liquid limit of soilusing Casagrande's standardLL device
5. Determination of Liquid limit of soil using ConePenetration apparatus
6. Determination of Plastic limit andShrinkagelimit of soil
7. Determination of grain size distribution by sieveanalysis
8. Determination of Field Density using CoreCutter and Sand Replacement Methods

Cycle – II: Determinationof Engineering Properties

9. Determination of Compaction Characteristics
10. Determination of Co-efficient of Permeability byConstant Head test
11. Determination of Co-efficient of Permeability by VariableHead test
12. Determination of shear parameters by Direct Shear Test
13. Determination of Unconfined Compressivestrength of soil
14. Determination of shear strength by VaneShear Test

Note: Minimum *Six* experiments from cycle - I and *Four* experiments from cycle – II should be conducted inthesemester.

Suggested Reading:

1. ***Soil Testing for Engineers,*** Wiley Eastern Ltd., NewDelhi, **Lambe, T.W**., 1969.
2. ***Soil Testing for Engineers****",* Khanna Publishers, **S.Mittal**, 1992.

Course Code	Course Title						Core/Elective
U21PW581CE	**Surveying Camp**						**Core**
Prerequisite	Total Contact Hours				**CIE**	**SEE**	Credits
	L	T	D	P			
Surveying & Geomatics and Surveying Lab	-	-	-	-	**50**	-	**2**

Course Objectives: During the course student is expected to do,

- Field exercises with modern surveying equipment including GPS and Total Station.
- All aspects of executing and plotting of field surveys and capturing topo graphical features
- Work in a team and make effective presentation

Course Outcomes: On successful completion of this course, students will be able to

1. Apply the principles and operate various advanced surveying instruments.
2. Compute the difference in elevation, draw and utilize contour plots, and volumes for earth work.
3. Practice working as a team member and lead a team
4. Demonstrate professional behavior in conducting the experiments and presenting the results effectively

Course Content:

A one week (6 days, 36 hours) surveying camp should be organized in the intervening period of IV semester and the commencement of V semester. The surveying camp should expose the students to all the aspects of planning, organizing and conducting a field survey, and plotting of the same. Necessary experiments required to conduct survey camp are to be covered if not covered in Surveying Lab course of III Semester. The work has to be evaluated for 50 marks by a committee consisting of the Head of the Department and 3-4 senior faculty members.